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THE DECKER-BIRNEY-ASHLAND AREA AND COAL DEVELOPMENT

An Economic Study

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June 1975

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I

INTRODUCTION

The Fort Union Coal Region stretches from the Canadian border through Montana, North Dakota, South Dakota, and Wyoming, and contains coal reserves estimated at over a trillion tons of coal. However, less than a tenth of the coal is close enough to the surface, and in thick enough seams, to be considered recoverable with current mining technology. Surface mining, also called strip mining, is the most economical way of recovering the coal. The unevenness of the region's coal seams, the type of rock formations over the coal beds, and the high capital investment required make underground mining impractical in most locations.

Surface mining is most economical where the veins of coal are relatively thick and close to the surface, and where the coal has a high heat value. One such area surrounds the communities of Decker, Birney, and Ashland in southwestern Montana--a sparsely populated, agriculturally oriented area.

The Decker-Birney-Ashland area contains billions of tons of recoverable, high-grade coal, and pressure is building to launch large-scale extractions of its coal resource to help meet the country's expanding need for fossil fuels. However, surface mining disturbs the land in the mining process. Coal conversion plants, such as electrical generating and gasification plants, use large quantities of water, would attract new people to the area, and may emit pollutants, which make them highly undesirable activities to many people. As a result, a confrontation has developed between those who favor industrial development of the coal resource in the Decker-Birney-Ashland area and those who feel the agricultural character and lifestyles of the area should not be changed just to facilitate extraction of the coal. The arguments of both parties have often been bitter and more emotional than factual in nature. Unfortunately, information about the economic implications of coal-related development on the economy of small areas in Montana has been very scant and often based upon the speculations of one pressure group or another. This report attempts to help fill this void by taking an impartial look at coal development and its implications for a small, rural section of Montana. We will begin in Chapter II by taking a close look at the economic structure of the study, or impact, area as it currently exists. In Chapter III, we will discuss the magnitude of coal development projects and, based on some alternative assumptions about future development in the area, project population, employment, and income for the area to 1980 and 1985. Chapter IV will summarize our conclusions about the economic effects of coal development in the Decker-Birney-Ashland area.

This report, by no means, has all the answers. An economy, even for a small area, is a complex mechanism responding to a variety of inputs; consequently, it is difficult to predict with accuracy its future course. The projections developed in this report are, at best, simply rough estimates and should be interpreted with a great deal of caution. However, we do feel they are accurate enough to enable us to discern some important implications of coal-related development in the study area.

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II

PROFILE OF THE AREA

This report is concerned with the impact of potential coal development on a small, sparsely populated area of eastern Montana. It focuses on the communities of Decker, Birney, and Ashland and on the Ashland Division of the Custer National Forest. Four census county divisions--the site of several large strippable coal deposits--are included in the impact area: Busby-Decker in Big Horn County; Ashland-Lame Deer-Birney in Rosebud County; and Stacey and Otter divisions in Powder River County.[1] Figure 1 depicts the area. Selecting census county divisions as our geographical unit allows us to utilize the relatively detailed information from the *1970 Census of Population* and still focus our attention on a small area of the state.

In addition to Decker, Birney, Ashland, and the Ashland Division of the Custer National Forest, the study area includes the Northern Cheyenne Indian Reservation and the eastern edge of the Crow Indian Reservation.

The streams and rivers of the area run predominantly to the Yellowstone River in the north. The Tongue River and its tributaries, Hanging Woman Creek and Otter Creek, drain to the north through the center of the

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[1] The Bureau of the Census uses several levels of geographical subdivision in its decennial census. The hierarchy, of importance to this study, is that counties are subdivided into census county divisions which, in turn, are composed of one or more enumeration districts.

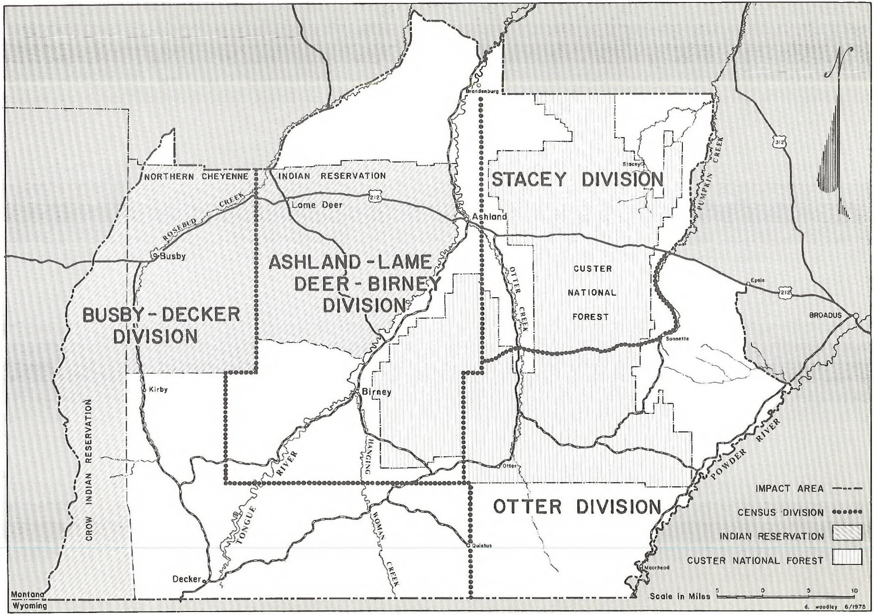

Figure 1: DECKER - BIRNEY - ASHLAND ECONOMIC IMPACT AREA

area. Rosebud Creek runs along the western edge while the Powder River and Pumpkin Creek mark much of the eastern boundary of the area.

Historically, the area has been predominantly a rural, agricultural area with livestock grazing on the extensive grassland ranges as the primary economic base of the area.

This report is an extension of the research concerning the economic impact of coal development in eastern Montana completed by Dr. Paul E. Polzin, entitled *Water Use and Coal Development in Eastern Montana.*[2] In his study, Dr. Polzin identified seven counties (Big Horn, Custer, Musselshell, Powder River, Rosebud, Treasure, and Yellowstone) as encompassing the major economic impact area of coal development in southeastern Montana, and the trade centers of Miles City and Billings as the cities which will feel much of the impact of population, income, and employment created by the development. Three of the seven counties--Big Horn, Powder River, and Rosebud--were singled out as the most likely sites for coal mining and processing facilities (figure 2). The study area in this report represents a portion of those three counties and includes at least a half dozen potential strip mining sites, near Decker, Birney, and Ashland.

Because the study area contains no urban area or major shopping center, the discussion of the area frequently will be within the framework of the seven-county area which contains Miles City and Billings.

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[2] Paul E. Polzin, *Water Use and Coal Development in Eastern Montana* (Missoula, Montana: University of Montana, Bureau of Business and Economic Research, 1974).

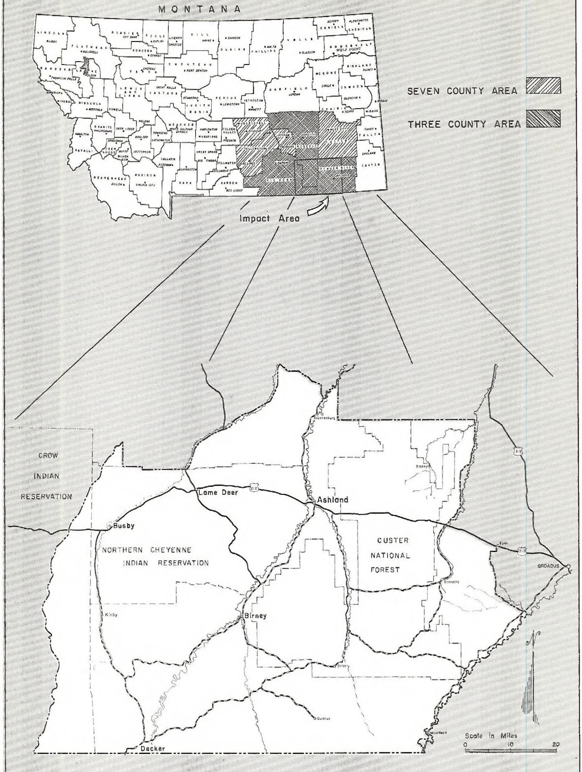

Figure 2: LOCATION OF THE IMPACT AREA

Residents of the Impact Area

The impact area covers an area of 3,648 square miles with a population of only 4,163 people in 1970, or 1.1 persons per square mile. This density is far lower than the seven-county area figure of 5.4 or the state figure of 4.7 persons per square mile. The sparse population of the area is not evenly distributed among the four divisions (table 2.1). The Ashland-Lame Deer-Birney division of Rosebud County had the majority of the population with a density of 2.5 persons per square mile, while the other three divisions all had less than one person per square mile, ranging as low as 0.3 persons per square mile for Otter division in Powder River County.

Indians make up a majority of the area's population, accounting for 59 percent of the residents in 1970.

Population figures by census enumeration districts (a further refinement of census county divisions) provide more information about population distribution (table 2.2 and figure 3). Nearly half of the 1970 population (2,081 persons) of the study area was concentrated in the eastern portion of the Northern Cheyenne Indian Reservation in Rosebud County (enumeration district 10); most--85 percent--were Indians. Lame Deer--the largest community in the study area, with 650 residents--lies within this district. Figure 3 documents the earlier reference to the very sparse population density in the remainder of the study area.

In the eastern part of the study area (the Stacey and Otter divisions), most of the land is owned by the federal government and the population is very small. Most of the Ashland Division of the Custer National Forest is included in the Stacey and Otter divisions.

Table 2.1

Population Density in the Impact Area
Seven-County Area and Montana
1970

	1970 Resident Population	Area[a]	Population Density[b]
Impact area	4,163	3,648	1.1
Busby-Decker CCD	1,036	1,211	0.9
Ashland-Lame Deer-Birney CCD	2,635	1,056	2.5
Stacey CCD	279	596	0.5
Otter CCD	213	785	0.3
Seven-county area[c]	123,295	22,720	5.4
Montana	694,409	147,138	4.7

Sources: U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana,* vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), tables 9 and 10, pp. 28-12 through 28-16; and idem, "Areas of Montana: 1960," *Area Measurement Reports,* GE-20, no. 28 (Washington, D.C.: U.S. Government Printing Office, 1964), table 1, pp. 5-7.

CCD denotes census county division.

[a] Includes total land and inland water area in square miles. These data are for 1960 rather than 1970 because there are no 1970 figures for the census county divisions and there are only minor differences between the 1960 and 1970 figures for the counties and the state.

[b] Persons per square mile.

[c] Includes Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 2.2

Resident Population, by Race, in the Impact Area and the Seven-County Area 1970

	White	Indian	Other	Total
Impact area	1,706	2,442	15	4,163
Busby-Decker CCD[a]	402	628	6	1,036
ED 18	244	0	3	247
ED 19	129	628	3	760
ED 20	29	0	0	29
Ashland-Lame Deer-Birney CCD[a]	824	1,806	5	2,635
ED 9	518	36	0	554
ED 10	306	1,770	5	2,081
Stacey CCD[b]	273	3	3	279
Otter CCD[b]	207	5	1	213
Seven-county area[c]	115,663	6,902	730	123,295

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), STIR11, tables 1 and 20; and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana*, vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), table 34, pp. 28-64 and 28-65.

CCD denotes census county division; and ED denotes census enumeration district.

[a] The enumeration districts were established to coincide with the Indian reservation areas within the division.

[b] Only one enumeration district which is coextensive with the census county division.

[c] Includes Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure and Yellowstone counties.

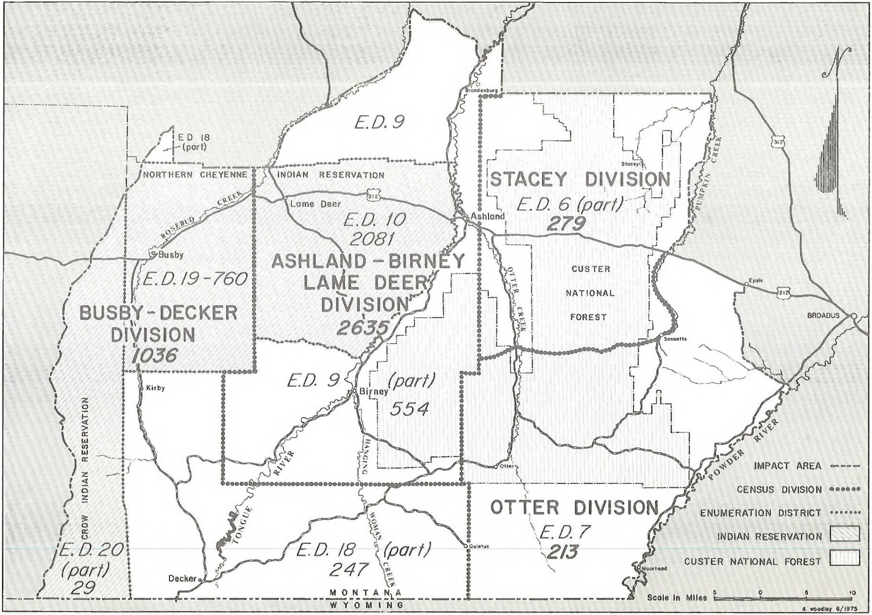

Figure 3: IMPACT AREA POPULATION DISTRIBUTION IN 1970

Population Trends

The study area had a rather rapid growth in population during the 1960s, increasing almost 15 percent, from 3,628 to 4,163.[3] This increase compares with 5 percent for the seven-county area and 3 percent for Montana as a whole (table 2.3). Most of the population growth in the study area was a result of a rapid increase in the Indian population.

The population change was not uniform throughout the area. The Ashland-Lame Deer-Birney division of Rosebud County recorded a gain of 559 persons, or 27 percent, from 1960 to 1970, while the Otter division of Powder River County declined by 67 persons, or 24 percent. Approximately 86 percent of the increase in the Ashland-Lame Deer-Birney division during the sixties was due to an increase in the Indian population, which grew from 1,324 in 1960 to 1,806 in 1970. This increase may be attributed to the higher Indian birth rate, a lower net outmigration rate for Indians, and a tendency for tribal members living off the reservation to move back onto reservation land.[4]

Population trends since 1950 for the three-county and seven-county areas are presented in table 2.4. The estimates for 1973 are not based on an actual count and are not as reliable as the figures for the census years.

The total population for the three-county area remained relatively constant, with only minor increases and decreases, during the 1950-1973 period.

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[3] Population data for census enumeration districts in Montana are only available for 1970, but data by census county divisions are available for both 1960 and 1970. County data are, of course, available for decennial census years prior to 1960.

[4] Polzin, pp. 53-55.

Table 2.3

Resident Population in the Impact Area
Seven-County Area and Montana
1960 and 1970

	Resident Population		Population Change 1960-1970	
	1960	1970	Persons	*Percent*
Impact area	3,628	4,163	535	*14.7*
Busby-Decker CCD	1,012	1,036	24	*2.4*
Ashland-Lame Deer-Birney CCD	2,076	2,635	559	*26.9*
Stacey CCD	260	279	19	*7.3*
Otter CCD	280	213	-67	*-23.9*
Seven-county area[a]	117,155	123,295	6,140	*5.2*
Montana	674,767	694,409	19,642	*2.9*

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana,* vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), tables 9 and 10, pp. 28-12 through 28-16. Number and percent change derived.

CCD denotes census county division.

[a] Includes Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 2.4

Resident Population in the Multi-County Areas 1950, 1960, 1970, and 1973

		Resident Population				Change in Population	
	1950	1960	1970	1973[a]	1950-1960	1960-1970	1970-1973
Big Horn	9,824	10,007	10,057	10,300	183	50	243
Powder River	2,693	2,485	2,862	2,300	-208	377	-562
Rosebud	6,570	6,187	6,032	6,900	-383	-155	868
Three-county area	19,087	18,679	18,951	19,500	-408	272	549
Custer	12,661	13,227	12,174	11,800	566	-1,053	-374
Musselshell	5,408	4,888	3,734	4,100	-520	-1,154	366
Treasure	1,402	1,345	1,069	1,100	- 57	- 276	31
Yellowstone	55,875	79,016	87,367	93,200	23,141	8,351	5,833
Seven-county area	94,433	117,155	123,295	129,700	22,722	6,140	6,405

Sources: U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1960, Number of Inhabitants, Montana,* PC(1)-28A (Washington, D.C.: U.S. Government Printing Office, 1960), table 6, p. 28-11; idem, *U.S. Census of Population: 1970, Characteristics of the Population, Montana,* vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), table 9, p. 28-12; and idem, "Estimates of the Population of Montana Counties and Metropolitan Areas, July 1, 1973 and 1974," *Current Population Reports,* Series P-26, no. 109 (Washington, D.C.: U.S. Government Printing Office, 1975), table 1.

[a] July 1, 1973 estimate.

The seven-county impact area experienced a growth in population from 94,433 in 1950 to 129,700 in 1973, an increase of 37 percent. Because of the large concentration of people in Billings, the major city, Yellowstone County dominates the seven-county statistics, accounting for 59 percent of the population in 1950 and 72 percent in 1973.

Net outmigration, the excess of people leaving an area over the number moving in, has been the major determinant of the population trends for most areas of Montana. Migration data are not available for census county divisions, but a summary of the net migration in the three- and seven-county areas is presented in table 2.5 for 1960 to 1970. With the exception of Powder River County, which had a net inmigration of 164, all the counties experienced net outmigration during the decade. The rural counties recorded higher net outmigration than Yellowstone County with its substantial urban population. Table 2.5 indicates that the large majority of the outmigrants in both areas were between the ages of fifteen and sixty-four, which corresponds to the prime years of employment.

Characteristics of the Resident Population

The majority of people in the study area are Indians. In 1970, 59 percent of the residents identified themselves as Indian compared to 41 percent who indicated white. Other races accounted for less than 0.4 percent of the population.

The racial makeup varies substantially by census division. Busby-Decker and Ashland-Lame Deer-Birney, encompassing the Northern Cheyenne Indian Reservation, reported more than 60 percent of their population as Indian. Stacey and Otter divisions closely resemble the seven-county area in terms of racial makeup: a white majority of 94 percent for the

Table 2.5

Net Migration by Broad Age Group in the Multi-County Areas 1960-1970

(Number of Net Migrants)

Age Group	Three-County Area[a]	Seven-County Area[b]
14 years old and under	- 450	- 630
15 to 64 years old	-1,838	-7,527
65 years old and over	- 240	- 25
Total, all ages	-2,528	-8,182

Sources: U.S. Department of Commerce, Bureau of the Census, *Census of Population and Housing: 1970, General Demographic Trends for Metropolitan Areas, 1960 to 1970, Montana,* PHC(2)-28 (Washington, D.C.: U.S. Government Printing Office, 1971), table 3, pp. 28-10 and 28-11. The distributions by broad age group were developed by the Bureau of Business and Economic Research, University of Montana (Missoula, Montana) from the county totals reported by the Bureau of the Census.

Note: A negative figure denotes net outmigration.

[a] Big Horn, Powder River, and Rosebud counties.

[b] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

seven-county area compares closely with 98 percent of Stacey and 97 percent for Otter (see table 2.2).

Reflecting the influence of the Indian population, the age distribution of the population in the study area is considerably younger than in either the seven-county area or the state of Montana. Table 2.6 shows that 39 percent of the residents in the impact area are under the age of fifteen as compared to 30 percent for both the seven-county area and the state of Montana. On the other end of the age distribution, only 13 percent of the area population is fifty-five years or older, as compared to 17 percent for the seven-county area and 19 percent for Montana.

Table 2.7 presents the age distribution of the Indian residents of the four divisions. In 1970, 45 percent of the Indian residents were under the age of fifteen and only 4 percent were sixty-five years or older. A comparison of tables 2.6 and 2.7 clearly shows the greater concentration of Indians in the younger age groups.

* * *

In summary, the impact area is sparsely populated, with extremely low population densities over most of the area. Indians are the major racial group in the area, but they are concentrated in and around the Northern Cheyenne Indian Reservation (the only significant concentration of population in the area). The population trend has been upward and is attributable to the increase in the Indian population. Also, the predominance of younger-aged Indians has lowered the age distribution of the study area relative to the seven-county area or the state of Montana.

Table 2.6

Age Distribution of the Population in the Impact Area
Seven-County Area and Montana
1970

	Under 5 Years	5-14 Years	15-24 Years	25-34 Years	35-44 Years	45-54 Years	55-64 Years	65 Years Old and Over	All Persons
Impact area	543	1,074	685	534	427	368	292	240	4,163
Percentage of total	*13.0*	*25.8*	*16.5*	*12.8*	*10.3*	*8.8*	*7.0*	*5.8*	*100.0*
Busby-Decker CCD	135	238	185	131	96	97	95	59	1,036
Ashland-Lame Deer-Birney CCD	366	719	437	336	265	223	155	134	2,635
Stacey CCD	27	70	40	32	40	20	27	23	279
Otter CCD	15	47	23	35	26	28	15	24	213
Seven-county area[a]	10,333	27,206	21,912	14,472	14,045	13,956	10,504	10,867	123,295
Percentage of total	*8.4*	*22.1*	*17.8*	*11.7*	*11.4*	*11.3*	*8.5*	*8.8*	*100.0*
Montana	57,054	150,876	121,868	79,879	74,998	77,837	63,161	68,736	694,409
Percentage of total	*8.2*	*21.7*	*17.5*	*11.5*	*10.8*	*11.2*	*9.1*	*9.9*	*100.0*

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), STIR7, tables 1 and 18; and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana*, vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), tables 21 and 35, pp. 28-42, 28-66, 28-68, and 28-74 to 28-79. Percentages derived.

Note: Percentage detail may not add to total because of rounding.

CCD denotes census county division.

[a] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 2.7

Age Distribution of the Indian Population in the Impact Area 1970

	Under 5 Years	5-14 Years	15-24 Years	25-34 Years	35-44 Years	45-54 Years	55-64 Years	65 Years Old and Over	Total
Impact area	397	714	465	295	204	184	106	87	2,452
Percentage of total	*16.2*	*29.1*	*19.0*	*12.0*	*8.3*	*7.5*	*4.3*	*3.5*	*100.0*
Busby-Decker CCD	106	161	143	70	43	51	32	25	631
Ashland-Lame Deer-Birney CCD	289	550	321	222	161	131	74	62	1,810
Stacey CCD	2	0	1	1	0	1	0	0	5
Otter CCD	0	3	0	2	0	1	0	0	6

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), STIR10, table 19. Percentages derived.

Notes: The data include ten nonwhite persons from other races--three in Busby-Decker CCD, four in Ashland-Lame Deer-Birney CCD, two in Stacey CCD, and one in Otter CCD. However, because of the arrangement of the original source data, these ten persons could not be separated out from the data on Indians above.

The percentage detail does not add to the total because of rounding.

CCD denotes census county division.

Incomes of the Area Residents

Personal income is an often-used measure of the economic well-being of a people. It is convenient because it can be expressed in dollar amounts and easily lends itself to arithmetic comparisons. Its major shortcoming is that it equates well-being with money income. In other words, income estimates do not take into account nonmoney benefits such as recreational opportunities, uncongested living areas, unpolluted environment, and other forms of "psychic income" which add to a person's well-being. Also, income estimates may not be a good measure when comparing racial, or ethnic, groups in which money incomes may be of varying importance in the social structure. In spite of its drawbacks, income is the only quantified and easily understood measure of the relative well-being of the people in the study area.

Money income data for the residents of the impact area are available from the *1970 Census of Population* summary tapes.[5] The census income estimates are based on a 20 percent sample from the 1970 census questionnaires. Approximately 62 percent of the income in the study area in 1969 came from wages and salaries, followed by farm self-employment which accounted for 14 percent (table 2.8). Comparing incomes of residents of the study area with the seven counties indicates a higher reliance on farm income and public assistance in the study area. Wages and salaries and nonfarm self-employment are less important sources of income in the

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[5] Income, as defined by the Census Bureau, is money income from wages and salaries, farm and nonfarm net self-employment, Social Security or railroad retirement, public assistance, and all other sources, such as interest, dividends, net income from rentals, veterans' payments, pensions, annuities, royalties, unemployment insurance, and workmen's compensation cash benefits.

Table 2.8

Income, by Source, of Impact Area Residents
1969

	Wages and Salaries	Self-employment Nonfarm	Self-employment Farm	Social Security or Railroad Retirement	Public Assistance	All Other	Total
Impact area	$ 4,911,050	$ 493,950	$ 1,122,350	$ 184,450	$ 268,500	$ 883,400	$ 7,863,700
Percentage of total	*62.4*	*6.3*	*14.3*	*2.3*	*3.4*	*11.2*	*100.0*
Busby-Decker CCD	1,065,400	99,400	554,200	58,050	70,350	545,150	2,392,550
Ashland-Lame Deer-Birney CCD	3,226,000	325,700	138,100	104,700	198,150	188,700	4,181,350
Stacey CCD	401,700	40,250	198,500	13,300	0	44,300	698,050
Otter CCD	217,950	28,600	231,550	8,400	0	105,250	591,750
Seven-county area[a]	242,427,450	37,187,250	16,846,650	12,763,950	2,114,500	24,781,450	336,121,250
Percentage of total	*72.1*	*11.1*	*5.0*	*3.8*	*0.6*	*7.4*	*100.0*

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), ST4P16 and ST4P17, table 8,80.

Note: Percentage detail may not add to total because of rounding.

CCD denotes census county divisions.

[a] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure and Yellowstone counties.

study area, no doubt reflecting a lack of employment and entrepreneurial opportunities. Table 2.9 indicates that the residents of the area had an aggregate money income of $7,863,700 for 1969. The per capita income of the area, $1,889, compares unfavorably with the per capita income of both the seven-county area, $2,718, and the state, $2,712. Ashland-Lame Deer-Birney division, with many Indian residents, had the lowest estimate of per capita income with $1,587; Otter division had the highest with $2,778. The reader is cautioned, however, that averages (arithmetic means) of income may be misleading because of the effect of a few high incomes (observations). Therefore in comparing incomes in an area, the median figure may be a better measure, so these estimates are also included. The median income is the amount which divides the distribution (observations) into two equal groups, one having incomes above the median and the other having incomes below the median.

Estimates of the median income of families and unrelated individuals in table 2.9 show the same general pattern but the differences among divisions are not as pronounced as those shown by the average figures. Again, Ashland-Lame Deer-Birney division reported the lowest incomes, $5,770 for families and $1,540 for unrelated individuals (persons not living in families). Otter division had the highest estimate of median family income at $7,830, while Busby-Decker division had an estimate of $2,970 for the median income of unrelated individuals. Estimates of median family income may also be slightly misleading because of differences in size of families among areas. For example, we know that Indian families tend to be larger, on the average, than non-Indian families. Overall, the median incomes indicate that the study area is substantially below the seven counties and the state in the level of money income.

Table 2.9

Incomes in the Impact Area
Seven-County Area
and Montana
1969

	Total Money Income	Per Capita Income	Median Income	
			Families	Unrelated Individuals
Impact Area	$ 7,863,700	$1,889	$6,240	$2,070
Busby-Decker CCD	2,392,550	2,309	7,090	2,970
Ashland-Lame Deer-Birney CCD	4,181,350	1,587	5,770	1,540
Stacey CCD	698,050	2,502	7,350	1,600
Otter CCD	591,750	2,778	7,830	2,420
Seven-county area[a]	335,150,843	2,718	8,580	NA
Montana	1,883,237,208	2,712	8,510	2,127

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970,* unpublished summary tape data (Helena, Montana), ST4P1, tables 1,75 and 2; and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana,* vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), tables 57 and 124, pp. 28-133 and 28-221 to 28-225. Per capita and median incomes derived.

CCD denotes census county divisions.

NA denotes not available.

[a] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure and Yellowstone counties.

Poverty is a problem in the study area. Based on a federal interagency committee definition of poverty, taking into account such factors as family size, sex and age of the family head, number of children, and farm-nonfarm residence, almost 28 percent of the residents of the area had incomes below the poverty level in 1969 (table 2.10). That figure includes members of families plus unrelated individuals. Nearly all were in the Busby-Decker and Ashland-Lame Deer-Birney divisions. The 28 percent figure may be compared to 14 percent in the seven-county area, and to 41 percent on the Northern Cheyenne Reservation. Clearly, Indian poverty is a problem of considerable dimensions in the study area.

Tables 2.11 and 2.12 compare the actual 1969 income distribution of Indian and non-Indian families and unrelated individuals and further confirm the generally lower incomes of the Indian people. Also, as we mentioned earlier, Indian families are generally larger than non-Indian families which accentuates the differences between the two groups. It should be noted, however, that significant numbers of non-Indians also reported very low incomes.

Employment and Earnings

Employment patterns in the study area are quite different from those in the larger seven-county area and in the state as a whole. Almost one-third of the study area's residents make their living in agriculture. Table 2.13 reports that 32 percent of total employment in the area was in agriculture, forestry, and fisheries; nearly all this was in agriculture, with forestry and fisheries relatively unimportant in terms of number of employed. As table 2.13 indicates, the study area is far more dependent upon agriculture than either the seven-county area or the state.

Table 2.10

Poverty Status of Residents of the Impact Area Northern Cheyenne Indian Reservation and Seven-County Area 1969

	Residents below Poverty Level			*Percentage of Total*[a]		
	Families	Unrelated Individuals[b]	All Persons[c]	*Families*	*Unrelated Individuals*	*All Persons*
Impact area	227	77	1,159	*24.9*	*37.7*	*27.8*
Busby-Decker CCD	50	6	232	*23.3*	*10.5*	*22.4*
Ashland-Lame Deer-Birney CCD	177	61	917	*30.3*	*54.5*	*34.8*
Stacey CCD	0	10	10	----	*50.0*	*3.6*
Otter CCD	0	0	0	----	----	----
Northern Cheyenne Indian Reservation[d]	175	29	916	*39.8*	*78.4*	*40.7*
Seven-county area[e]	3,316	3,972	17,052	*10.9*	*35.0*	*13.8*

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970,* unpublished summary tape data (Helena, Montana), ST1R1, ST4P23, ST4P24, and ST4P27, tables 1, 82, 83 and 89,95; U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana,* vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), tables 10 and 124, pp. 28-13 to 28-16 and 28-221 to 28-225; and idem, *U.S. Census of Population: 1970, American Indians,* PC(2)-1F (Washington, D.C.: U.S. Government Printing Office, 1973), table 14, p. 172. Percentages for all areas and all other data for the impact area were derived.

Note: The poverty status is based on a federal interagency committee definition of poverty which takes into account such factors as family size, age and sex of the family head, number of children, and farm-nonfarm residence.

CCD denotes census county division.

[a] Number of residents (families, unrelated individuals, or all persons) below poverty level expressed as a percentage of all residents (families, unrelated individuals, or all persons) in the specific area.

[b] A person fourteen years of age or older who is a member of a household but not related to anyone else in the household or is living in group quarters (other than an inmate of an institution).

[c] All persons in families and all unrelated individuals; i.e., the total population.

[d] The Reservation is located within the impact area, overlapping parts of the Busby-Decker and Ashland-Lame Deer-Birney census county divisions.

[e] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 2.11

Family Incomes in the Impact Area and Seven-County Area 1969

	Less than $1,000	$1,000-$1,999	$2,000-$2,999	$3,000-$3,999	$4,000-$5,999	$6,000-$7,999	$8,000-$9,999	$10,000-$11,999	$12,000-$14,999	$15,000-$24,999	$25,000-$49,999	$50,000 and over	All Families
Number of families													
Impact area[a]	39	58	83	50	206	176	76	99	43	63	14	6	913
Indian[b]	16	40	70	35	111	62	48	43	15	9	4	0	453
Non-Indian[c]	23	18	13	15	95	114	28	56	28	54	10	6	460
Seven-county area[d]	662	1,008	1,477	1,753	3,850	4,939	4,857	3,847	3,614	3,418	826	184	30,435
Percentage of total													
Impact area[a]	*4.3*	*6.4*	*9.1*	*5.5*	*22.6*	*19.3*	*8.3*	*10.8*	*4.7*	*6.9*	*1.5*	*0.7*	*100.0*
Indian[b]	*3.5*	*8.8*	*15.5*	*7.7*	*24.5*	*13.7*	*10.6*	*9.5*	*3.3*	*2.0*	*0.9*	---	*100.0*
Non-Indian[c]	*5.0*	*3.9*	*2.8*	*3.3*	*20.7*	*24.8*	*6.1*	*12.2*	*6.1*	*11.7*	*2.2*	*1.3*	*100.0*
Seven-county area[d]	*2.2*	*3.3*	*4.9*	*5.8*	*12.6*	*16.2*	*16.0*	*12.6*	*11.9*	*11.2*	*2.7*	*0.6*	*100.0*

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), ST4P2, table 75; and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana*, vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), table 124, pp. 28-221 to 28-225. Percentages derived.

Note: Percentage detail may not add to total because of rounding.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Northern Cheyenne Indians residing in the Busby-Decker and Ashland-Lame Deer-Birney census county divisions.

[c] May include two or three Indian families residing in Stacey and Otter census county divisions.

[d] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 2.12

Incomes of Unrelated Individuals in the Impact Area and Seven-County Area 1969

	Less than $1,000	$1,000-$1,999	$2,000-$2,999	$3,000-$3,999	$4,000-$5,999	$6,000-$7,999	$8,000-$9,999	$10,000-$11,999	$12,000-$14,999	$15,000-$24,999	$25,000-$49,999	$50,000 and over	All Unrelated Individuals
Number of unrelated individuals													
Impact area[a]	53	47	29	7	12	12	18	15	0	11	0	0	204
Indian[b]	26	7	4	0	0	0	0	0	0	0	0	0	37
Non-Indian	27	40	25	7	12	12	18	15	0	11	0	0	167
Seven-county area[c]	2,301	2,945	1,620	1,190	1,327	946	526	225	116	124	38	0	11,358
Percentage of total													
Impact area[a]	26.0	23.0	14.2	3.4	5.9	6.1	8.8	7.4	0.0	5.4	---	---	100.0
Indian[b]	70.3	18.9	10.8	----	----	----	----	---	---	---	---	---	100.0
Non-Indian	16.2	24.0	15.0	4.2	7.2	7.2	10.8	9.0	---	6.6	---	---	100.0
Seven-county area[c]	20.3	25.9	14.3	10.5	11.7	8.3	4.6	2.0	1.0	1.1	0.3	---	100.0

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), ST4P3, table 76. Percentages derived.

Notes: Unrelated individuals are persons fourteen years of age and older who are members of a household but not related to anyone else in the household or are living in group quarters (other than inmates of institutions). Percentage detail may not add to total because of rounding.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Northern Cheyenne Indians residing in the Busby-Decker and Ashland-Lame Deer-Birney census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 2.13

Civilian Employed Persons by Major Industry Group
in the Impact Area, Seven-County Area
and Montana
1970

	Civilian Employed Persons			*Percentage of Total*		
	Impact Area[a]	Seven-County Area[b]	Montana	*Impact Area*[a]	*Seven-County Area*[b]	*Montana*
Agriculture, forestry, and fisheries	451	4,404	32,726	*31.6*	*9.6*	*13.4*
Mining	6	648	5,877	*0.4*	*1.4*	*2.4*
Construction	34	3,014	15,674	*2.4*	*6.6*	*6.4*
Manufacturing	217	3,547	23,626	*15.2*	*7.8*	*9.7*
Transportation, communication, and public utilities	41	4,179	19,458	*2.9*	*9.2*	*8.0*
Wholesale trade	0	3,031	9,360	----	*6.6*	*3.8*
Retail trade	69	9,109	45,165	*4.8*	*19.9*	*18.5*
Finance, insurance, and real estate	28	2,083	9,546	*2.0*	*4.6*	*3.9*
Business, personal, health, and professional services	56	8,102	39,322	*3.9*	*17.7*	*16.1*
Education and public administration	337	6,592	39,566	*23.6*	*14.4*	*16.2*
Welfare, religious, and nonprofit organizations	190	952	4,288	*13.3*	*2.1*	*1.8*
All employed persons	1,429	45,661	244,608	*100.0*	*100.0*	*100.0*

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), ST4P69-ST4P71, table 62; and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana*, vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), tables 55 and 123, pp. 28-129 and 28-216 to 28-220. Percentages derived.

Notes: The data pertain to persons sixteen years of age and older who are in the civilian labor force. Percentage detail may not add to total because of rounding.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

The area also has a substantially larger proportion of employment in manufacturing, due to the presence of a sawmill and a plastics factory, and in education and public administration and welfare, religious and nonprofit organizations. The latter concentration results from U.S. Bureau of Indian Affairs and other Indian service agency employment on and near the Northern Cheyenne Reservation. On the other hand, there is a strikingly small amount of employment in wholesale and retail trade, finance, and services, reflecting the absence of these activities in the sparsely settled, rural area.

The occupations of workers (table 2.14) reflect the differences in industrial makeup of the study area, the seven-county area, and the state. There are substantially more farm workers and fewer professional, technical, and sales workers and craftsmen.

Table 2.15 presents the available data for earnings by occupation in 1969 in the study area. Both the median and average figures for males show wide differences in earnings among occupations, with operatives at the bottom of the scale and professional and managerial workers earning the most. Once again, averages tend to be higher than medians because of the effect of a few high observations. The earnings of females, concentrated in clerical and operative jobs, were substantially lower than for males. Lower female earnings probably reflect not only lower wage scales, but also shorter work weeks and fewer weeks worked during the year.

Unemployment averaged 5.1 percent of the civilian labor force in the study area as of April 1970, not significantly different from the 5.0 percent figure for the entire seven-county area.[6] Unemployment among the

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[6] Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), ST4P59 and ST4P60, table 122.

Table 2.14

Civilian Employed Persons by Occupation
in the Impact Area, Seven-County Area
and Montana
1970

	Civilian Employed Persons			*Percentage of Total*		
	Impact Area[a]	Seven-County Area[b]	Montana	*Impact Area*[a]	*Seven-County Area*[b]	*Montana*
Professional, technical, and kindred workers	137	6,258	35,088	*9.6*	*13.7*	*14.3*
Managers and administrators, except farm managers	117	5,246	24,878	*8.2*	*11.5*	*10.2*
Sales workers	6	3,724	15,535	*0.4*	*8.2*	*6.4*
Clerical and kindred workers	210	7,466	35,330	*14.7*	*16.4*	*14.4*
Craftsmen, foremen, and kindred workers	100	5,361	31,022	*7.0*	*11.7*	*12.7*
Operatives, except transport	107	2,964	17,565	*7.5*	*6.5*	*7.2*
Transport equipment operatives	53	2,038	9,345	*3.7*	*4.5*	*3.8*
Laborers, except farm	94	1,922	11,386	*6.6*	*4.2*	*4.7*
Farmers and farm managers	263	2,516	18,844	*18.4*	*5.5*	*7.7*
Farm laborers and farm foremen	178	1,528	9,621	*12.5*	*3.3*	*3.9*
Service workers, except private household	157	6,115	32,982	*11.0*	*13.4*	*13.5*
Private household workers	7	523	3,012	*0.5*	*1.1*	*1.2*
All employed persons	1,429	45,661	244,608	*100.0*	*100.0*	*100.0*

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970,* unpublished summary tape data (Helena, Montana), ST4P63-ST4P65, table 58; and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana,* vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), tables 54 and 122, pp. 28-127 and 28-211 to 28-215. Percentages derived.

Notes: Percentage detail may not add to total because of rounding.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 2.15

Earnings of Males and Females by Occupational Group in the Impact Area and Montana 1969

	Impact Area										Montana
	Less than $1,000	$1,000-$1,999	$2,000-$3,999	$4,000-$5,999	$6,000-$7,999	$8,000-$9,999	$10,000-$14,999	$15,000 and over	Average Earnings	Median Earnings	Median Earnings
Males											
Professional, managerial, and kindred workers	6	0	16	22	32	21	56	18	$9,160	$9,450	$9,090
Craftsmen, foremen, and kindred workers	6	9	22	33	22	8	7	0	4,920	4,970	7,590
Operatives, including transport	27	7	29	23	9	8	0	0	3,360	2,030	6,730
Laborers, except farm	7	9	26	14	11	0	0	0	3,390	2,670	5,090
Farms and farm managers	34	43	64	34	30	20	0	29	4,840	3,180	5,630
Farm laborers, except unpaid, and farm foremen	17	46	35	21	18	0	0	5	4,170	2,470	2,800
Females											
Clerical and kindred workers	26	24	83	27	0	0	0	0	2,660	2,830	3,380
Operatives, including transport	6	9	33	7	0	0	0	0	2,590	2,830	2,400

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), ST4P7-ST4P12 and ST4P14-ST4P15, tables 6,78 and 7,79; and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana*, vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), table 57, p. 28-133. Median and average earnings for the impact area were derived.

Notes: The data are for persons sixteen years of age and older with earnings who are in the experienced civilian labor force.

The impact area includes Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

Indians residing on the Northern Cheyenne Reservation amounted to 10.7 percent of the Indian labor force as reported by the Bureau of the Census.[7] Even this dismal picture of employment opportunities on the Reservation may be too rosy. The census definition of the unemployed includes those who were without a job but looking for work.[8] This excludes persons who would like to work but were not actively seeking work at the time of the census. The U.S. Bureau of Indian Affairs estimates that many Northern Cheyenne Indians fall into this category and that, if they had been included, the actual employment rate would have been between 25 and 30 percent of the labor force.[9]

* * *

In summary, the employment pattern by industry and occupation in the study area reflects the agricultural base of the economy, and the relative lack of professional and service-related employment. One prominent feature is the high percentage of education, public administration, welfare, and nonprofit employment, reflecting the importance of government employment and educational and welfare programs associated with the Northern Cheyenne Reservation.

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[7] Ibid.

[8] U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Characteristics of the Population, Montana*, vol. 1, pt. 28 (Washington, D.C.: U.S. Government Printing Office, 1973), Appendix B, p. App-20.

[9] U.S. Department of the Interior, Bureau of Indian Affairs, "Indians in the Northern Great Plains: Anticipated Socio-Economic Impacts of Coal Development," prepared for the Socio-Economic Work Group of the Northern Great Plains Resources Program, mimeographed (Billings, Montana, n.d.), table 4, p. 7.

The occupational groups with the lowest average earnings--operatives, laborers, farmers, and farm laborers and foremen--accounted for about half of the total employment. The remaining half consisted of a few relatively higher-paid professionals, managers, and craftsmen and a larger number of clerical, sales and service workers. The overall occupational mix is more heavily weighted by the lower-paid occupations than is the case in the seven-county area or the state as a whole. All of the occupations, with the exception of male professional and managerial workers and female operatives, had estimated median earnings which were substantially below the comparable estimate for the state (table 2.15).

Unemployment is a serious problem among the Indian population of the area--more serious than unemployment figures indicate, because persons who have ceased searching for employment are not included in the estimates.

Agriculture

Earlier we saw that farms and ranches play an important role in the economy of the impact area. Coal-related development may impinge on agriculture because the surface mining of coal will, at least temporarily, remove some land from agricultural production; and to the extent that the new industries are significant water users, they will compete with agriculture for the existing supplies of this resource. Agriculture and water use are closely related. We will defer the discussion of irrigation and other water uses until a later section.

Unfortunately, agricultural data are available only for entire counties, and county-wide averages may misrepresent the conditions of specific areas. The data presented show varying conditions in Big Horn, Powder River, and Rosebud counties; and, since the study area is made up of portions of these counties, the conditions in those sections may be quite different from the average for the entire county. Consequently, the analysis will not be as detailed as we would like, and we must interpret the data with caution.

General Characteristics of Agriculture

Agriculture is the dominant form of land use in the three-county area. Table 2.16 reports that, overall, almost 88 percent of all land in these counties is devoted to farms and ranches. This compares with the statewide figure of about 68 percent of the total land area in agriculture.

The average farm or ranch in these counties covered 5,776 acres, over twice the 2,522-acre average for all of Montana. The value of agricultural land and buildings totaled over $278 million for an average of $215,497 per farm, well above the statewide average of $150,222 per farm. When compared to the land area, however, the value of land and buildings is only $37.31 per acre, a little less than two-thirds the average of $59.57 per acre for all of Montana. It appears that the value of all farms and ranches in the three counties is greater than the state average simply because the farms and ranches are larger; on a per-acre basis the land and buildings are valued far below the average for all farms and ranches in Montana.

Table 2.16 reports that in the three counties 597,894 acres, representing 8 percent of all farm and ranchland, were devoted to crops. In general, the major grain crops (wheat, barley, and oats) are grown on nonirrigated land. On the other hand, sugar beets and dry beans are grown entirely on irrigated acreage. Most irrigated land is devoted to

Table 2.16

Selected Characteristics of Farms and Ranches in the Three-County Area by County, and in Montana
1969

	Three-County Area				
	Big Horn County	Powder River County	Rosebud County	Total	Montana
Land area in farms and ranches (acres)	2,816,994	1,694,561	2,963,025	7,474,580	62,918,247
Percentage of total land area	*87.6*	*80.5*	*91.9*	*87.5*	*67.5*
Number of farms and ranches	540	364	390	1,294	24,951
Average size (acres)	5,217	4,655	7,598	5,776	2,522
Value of land and buildings	$136,581,000	$58,586,000	$83,685,000	$278,853,000	$3,748,207,000
Per farm	$ 252,928	$ 160,951	$ 214,576	$ 215,497	$ 150,222
Per acre	$ 48.48	$ 34.57	$ 28.24	$ 37.31	$ 59.57
Cropland (acres)	294,794	154,942	148,158	597,894	16,108,575
Percentage of total land in farms and ranches	*10.5*	*9.1*	*5.0*	*8.0*	*25.6*

Source: U.S. Department of Commerce, Bureau of the Census, *Census of Agriculture: 1969, Area Reports, Montana,* vol. 1, pt. 38, sec. 2 (Washington, D.C.: U.S. Government Printing Office, 1972), table 1, pp. 1, 17, 305, and 353. Percentages derived.

hay, much of which is consumed by livestock on the farm.[10] The largest category of agricultural land use in all three counties is unimproved pastureland and rangeland.[11] Thus, even though agriculture dominates the land use patterns in the three-county area, only a very small portion of the land was actually used to grow crops. The remainder was used for grazing livestock.

Income and Profitability

The income and receipts of farms and ranches in the three counties and in Montana during 1970 and 1972 are summarized in table 2.17. The 1970 estimates have been substantially revised by the U.S. Bureau of Economic Analysis since they originally appeared in Dr. Polzin's study on coal development. These data are also for counties and, as we mentioned earlier, may not accurately reflect the economic conditions in the study area. If interpreted with caution, however, this information may reveal certain characteristics of farms and ranches in this part of the state.

Table 2.17 demonstrates the specialization in livestock of the farms and ranches in the three-county area. During 1970, these farms and ranches received almost $35 million from the sale of livestock as compared to a little over $10 million from the sale of crops--approximately a three-to-one ratio. In 1972, the ratio was almost four to one. (Crop receipts do not include those crops grown and consumed on the ranch, such

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[10] Montana Department of Agriculture and U.S. Department of Agriculture, Statistical Reporting Service, *Montana Agricultural Statistics,* vol. 14 (Helena, Montana, 1972), pp. 30, 34, 46, 48, 51, and 54.

[11] U.S. Department of Commerce, Bureau of the Census, *Census of Agriculture: 1969, Area Reports, Montana,* vol. 1, pt. 38, sec. 2 (Washington, D.C.: U.S. Government Printing Office, 1972), table 1, pp. 1, 17, 305, and 353.

Table 2.17

Agricultural Receipts and Income in the Three-County Area and Montana
1970 and 1972

	Three-County Area[a]		Montana	
	1970	1972	1970	1972
Total gross income	$54,637,000	$68,993,000	$860,087,000	$1,044,576,000
Average per farm	42,223	NA	34,471	NA
Average per acre	7.31	NA	13.67	NA
Cash receipts from farm marketings	44,994,000	61,756,000	690,726,000	886,205,000
Livestock	34,682,000	49,014,000	444,809,000	619,669,000
Crops	10,312,000	12,742,000	245,917,000	266,536,000
Government payments	3,702,000	6,011,000	85,361,000	103,169,000
Nonmoney income	5,941,000	4,223,000	84,000,000	55,202,000
Total net income[b]	20,776,000	24,601,000	282,873,000	342,680,000
Average per farm	16,056	NA	11,337	NA
Average per acre	2.78	NA	4.50	NA

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System, unpublished data (Washington, D.C., November 1974). Averages per farm and per acre for 1970 were derived using data on the number of farms and acres in 1969 as reported in U.S. Department of Commerce, Bureau of the Census, *Census of Agriculture: 1969, Area Reports, Montana,* vol. 1, pt. 38, sec. 2 (Washington, D.C.: U.S. Government Printing Office, 1972), table 1, pp. 1, 17, 305, and 353.

NA denotes that the figures are not available; in this case, the averages per farm and acre could not be derived because data on the number of farms and acres are not available for 1972.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Adjusted from net change in farm inventories.

as hay used for livestock.) For the state as a whole, $620 million was realized from the sale of livestock while crop receipts totaled $267 million in 1972--a ratio of about two to one.

The data in table 2.17 suggest that the farms and ranches in the three-county area are more profitable than the average farm or ranch in Montana. During 1970, total net agricultural income in the three counties was $21 million, or an average of $16,056 per farm. This is far above the average statewide net income of $11,337 per farm. But, the average net income per acre in the three-county area, $2.78, is much lower than the statewide average of $4.50 reflecting the lower productivity of land in the area. The increases in farm incomes in the three-county area and Montana from 1970 to 1972, the latest year for which comparable data are available, are largely attributable to increases in receipts from livestock marketings.

Although agricultural data for subcounty areas are extremely limited, there are a few general facts we know about the study area. 1) Cattle grazing is the most important agricultural activity. 2) Approximately 10 to 30 acres of rangeland are required to support one cow for a seven-month grazing season, depending on the quality of the land and precipitation.[12] 3) The topography, climate, and soil make cultivation impractical in most locations.[13] 4) Irrigated farming utilizes only a small fraction of the land. Approximately 20,700 acres of the 2.3 million acres in the study area are irrigated--less than 1 percent of the land.[14] 5) The major irrigated crop is alfalfa hay, with some irrigation of native hay meadows. Most crops grown in the study area are used for livestock forage and not sold as cash crops.[15] A "ballpark estimate" of the area used for dry-land farming is 32,000 acres.[16] 6) In 1970, approximately 432 persons, sixteen years of age or older, were employed in agriculture in the study area. The U.S. Bureau of the Census estimates that 222 persons were self-employed farmers or ranchers, 32 were corporate ranchers, 148 were agricultural laborers or managers, and 30 persons were unpaid family workers.[17]

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[12] U.S. Department of Agriculture, Forest Service, Custer National Forest, unpublished data (Billings, Montana, May and June 1975).

[13] U.S. Department of the Interior, Bureau of Land Management, unpublished data (Billings, Montana, 1975).

Many area ranchers, whose ranch units are adjoining public lands, lease rangeland from the U.S. Forest Service, U.S. Bureau of Land Management, and the state of Montana. They are heavily dependent upon public lands for summer grazing and they cultivate a large portion of their deeded acres (usually along the drainage bottoms) to provide hay for winter forage when the ranges are closed. This pattern enables them to maintain larger cattle herds on a year-round basis than would be possible with their deeded acreage alone. Information from the Bureau of Land Management and the Forest Service indicates there are at least 215 grazing permit agreements for federal rangeland within the study area.[18]

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[14] Montana Department of Natural Resources and Conservation, Water Resources Division, unpublished data (Helena, Montana, May 1975).

[15] U.S. Department of the Interior, Bureau of Land Management, unpublished data.

[16] Ibid. Derived.

[17] Montana Department of Intergovernmental Relations, *U.S. Census of Population: 1970*, ST4P79 and ST4P80, table 67.

[18] U.S. Department of the Interior, Bureau of Land Management, unpublished data; and U.S. Department of Agriculture, Custer National Forest, unpublished data.

In summary, farms and ranches within the study area are generally large, cattle-grazing operations, raising hay crops for winter cattle forage and often utilizing public land for summer grazing.

Mining and Mineral Resources

The mineral resources within the impact area are limited to oil and gas, coal, sand, gravel, and clinker.

Oil and Gas

The leasing of rights to federal oil and gas has been extensive in the impact area but to date no major commercial deposits have been discovered. The only producing area is the Ash Creek field on the southern edge of the Crow Indian Reservation (almost on the Montana-Wyoming border) which produced 13,254 barrels of oil from three wells in 1972.[19]

Sand, Gravel, and Clinker

Several sand and gravel pits located in the area are used by the Montana Highway Department and local landowners for road fill. Clinker, a brightly colored rock residue formed by the burning of coal outcroppings, is found in great abundance and is also used locally to surface and improve roads. To our knowledge there are no operations of any substantial size producing these aggregates commercially.

Coal

The major mineral, in terms of economic value to the area, is coal. The coal fields in the area are part of the Tongue River Member of the

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[19] Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division, *Annual Review for the Year 1972 Relating to Oil and Gas*, vol. 16 (Helena, Montana, 1973).

Fort Union geologic formation which covers portions of Montana, Wyoming, the Dakotas, and Canada. Based on information from the Montana Bureau of Mines and Geology and the U.S. Bureau of Indian Affairs, we estimate that the study area contains 31.6 billion tons of strippable coal reserves.[20] Of the total, approximately 5 billion tons underlie the Northern Cheyenne Reservation and 2 billion tons are in the eastern edge of the Crow Reservation covered by the impact area.[21] Figure 4 depicts the major coal deposits in the study area.

The quality of the coal varies from lignite to subbituminous (6,300-10,500 Btu) and, with few exceptions, the coal is low in sulfur and has low-to-moderate ash content. It is the low sulfur content of Montana's coal which makes it attractive to eastern coal users who are faced with stringent air pollution controls and relatively high-sulfur coal mined locally.

Decker Coal Company is the only firm with a major mining operation in the impact area.[22] The mine, located at Decker, was started in 1972 and produced 7 million tons of coal in 1974. By 1980, the production is projected to be from 13 to 20 million tons per year, assuming that a

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[20] For detailed estimates by coal field, see Robert E. Matson and John W. Blumer, *Quality and Reserves of Strippable Coal, Selected Deposits, Southeastern Montana,* Bulletin 91 (Butte, Montana: Montana College of Mineral Science and Technology, Montana Bureau of Mines and Geology, 1973).

[21] U.S. Department of the Interior, "Indians in the Northern Great Plains," p. 13; and idem, Bureau of Indian Affairs, *Projected Coal Development: Crow Indian Reservation,* Draft Programmatic Environmental Statement DES 75-2 (Billings, Montana, 1975), p. 279.

[22] A small open-pit mine is also located on the Ashland Division of the Custer National Forest in Powder River County. This mine, named the Coal Creek Mine, produced 1,727 tons of coal in 1972 and was reported by the Montana Bureau of Mines and Geology as still producing in 1973.

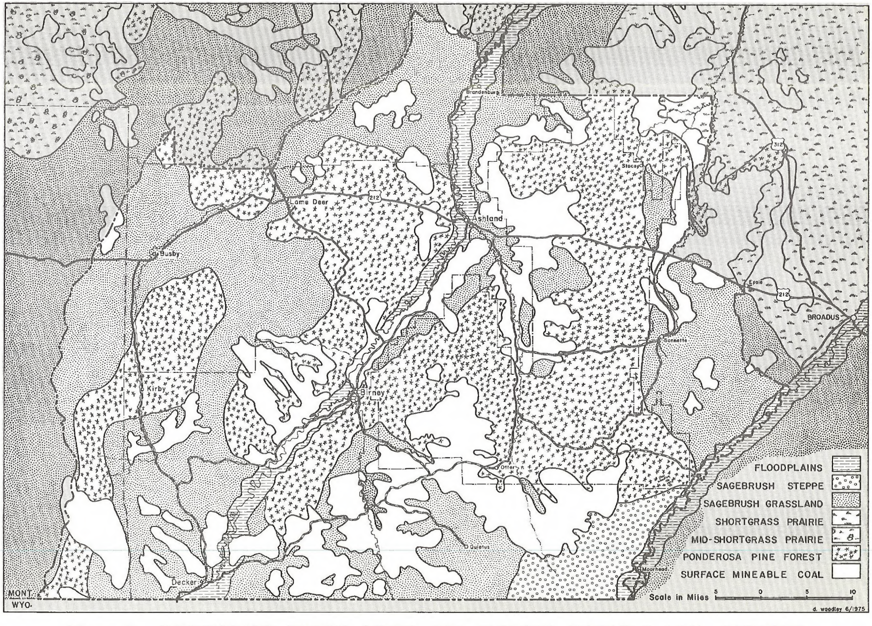

Figure 4: PREDOMINANT GROUND COVER AND SURFACE MINEABLE COAL DEPOSITS

currently proposed expansion of the mine is approved. Current employment is about 220 employees at the mine site.[23]

Two additional mines are in the planning stage: 1) Shell Oil is considering a mine for the southeastern section of the Crow Reservation on Young's Creek to produce 8 million tons by 1980; and 2) Decker Coal Company is attempting to obtain permits for another mine to be located east of the Tongue River Reservoir. Several other companies have leases on mineral rights in the area or are making application for leases or prospecting permits.

Wood Products Industry

The study area includes one of the largest concentrations of timbered land in southwestern Montana. The western portion of the timbered area is located on the Northern Cheyenne Indian Reservation. The eastern portion has been established as the Ashland Division of the Custer National Forest (see figure 4). Ponderosa pine is the principal specie, with trees ranging from pole size, 35 to 80 years old, to mature and overmature sawtimber, 200 years old with evidence of 300-year-old trees.[24]

The Ashland Division covers 502,153 acres, which includes 80,000 acres of timbered land with an estimated 324 million board feet of timber. The timber harvest from the Ashland Division has averaged 1.2 million board feet per year for the last nine years. The timber cut has varied substantially, however, from a low of 10,000 board feet in 1973 to a high of 4.5 million board feet in 1972.[25]

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[23] Statements by John F. Ratchye, Jr. Peter Kiewit Sons' Company, personal and telephone interviews, Sheridan, Wyoming, April and June 1975.

[24] U.S. Department of the Interior, Bureau of Land Management, unpublished data.

Approximately 130,000 acres of the Northern Cheyenne Indian Reservation are timbered and contain approximately 338 million board feet of timber. The average timber cut has been about 3 million board feet per year for the last five years.[26]

The Wolf Mountains on the eastern edge of the Crow Indian Reservation also contain some stands of ponderosa pine, though there is great variation in age and stand density. The Wolf Mountains are estimated to contain about 27,500 acres of commercial forest land, an undetermined portion of which lies outside our study area.[27]

Private, state, and federal lands administered by the Bureau of Land Management in the study area also contain forested areas, but are generally considered noncommercial stands. Most are of low value for sawtimber production and used only for posts and poles by local users.[28]

Two lumber mills are currently operating in the study area: a small mill in Lame Deer and a larger one in Ashland. The Lame Deer sawmill employs about 9 workers and produces about 500,000 board feet of lumber per year, principally railroad ties, from timber purchased from the Northern Cheyenne Indian Reservation.[29]

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[25] U.S. Department of Agriculture, Custer National Forest, unpublished data.

[26] Statement by Keith Beartusk, U.S. Bureau of Indian Affairs, telephone interview, Lame Deer, Montana, June 1975.

[27] U.S. Department of the Interior, *Projected Coal Development,* p. 94.

[28] U.S. Department of the Interior, Bureau of Land Managment, unpublished data.

[29] Statement by Keith Beartusk.

The mill at Ashland was partially destroyed by fire in 1972 and its reconstruction has only recently been completed. Employment is projected to be from 70 to 80 employees in the mill and woods crew when full operation is reached in 1975. The remodeled mill should be capable of sawing 12 million board feet of timber per year. The finished lumber will be shipped to Midwest markets.[30] The interruption of production has caused large fluctuations in the annual cut on both the Northern Cheyenne Reservation and the Ashland Division, since the Ashland sawmill is the only large purchaser of timber in the area.

The timber cut for the Northern Cheyenne Reservation is expected to be about 5 million board feet in 1975, which will be increased to 8 to 10 million board feet per year for the next two or three years to complete a current timber contract with the Ashland mill.[31] The Forest Service is in the process of preparing a 4-million-board-feet sale within the Ashland Division to be cut in the next two years.[32] The two existing sawmills now have the annual capacity to utilize all of the allowable timber cut of both the Northern Cheyenne Reservation and the Ashland Division.

The wood products industry is an important part of the study area's economic base. The sawmills provide relatively stable, year-round employment for approximately 70 employees. Additional seasonal employment is also provided for cutting crews and log haulers. (The wages of these workers, approximately $8,300 per year at 1975 wage rates, are considerably above the wages paid in alternative types of employment in the study area, principally agricultural jobs.[33]) Revenue from the sale of timber also provides substantial income to the Northern Cheyenne Reservation. A portion of the monies received by the Custer National Forest (25 percent of the net proceeds) is returned to county governments on the basis of the percentage of the forest lands located within the counties.[34]

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[30] Statements by Al Carpenter, Eastmont Forest Products, Inc., personal and telephone interviews, Ashland, Montana, April and June 1975.

[31] Statement by Keith Beartusk.

[32] U.S. Department of Agriculture, Custer National Forest, unpublished data.

Although the wood products industry is important, economically, to the study area, its impact is quite small relative to the wood products industry of the state. Approximately 23 million acres, or 25 percent of the state, are covered by forest, as compared to about 10 percent of the study area.[35] The annual timber harvest in Montana has averaged over 1.1 billion board feet for the last five years with only a small fraction of the total (4 to 5 million board feet) coming from the study area.[36]

Water Resources and Use

Water is used extensively by agriculture in southeastern Montana and it is a precious commodity. Rainfall averages from fourteen to sixteen inches and above per year in the study area.[37] Wells are often used to supplement streams as sources of water for irrigation and livestock. The processing of Montana coal also will require extensive water and, thus, may be in direct competition with agriculture. (Coal mining itself consumes little water. Its primary impact will be on the supply of groundwater, which will be discussed later.) With this potential conflict in mind, we will examine the current sources and uses of water first and in a later section will explore the possibilities for increased utilization and for new supplies.

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[33] Statements by Al Carpenter.

[34] Dennis L. Schweitzer, Robert E. Benson, and Richard J. McConnen, *A Descriptive Analysis of Montana's Forest Resources*, Resource Bulletin INT-11 (Ogden, Utah: USDA Forest Service, Intermountain Forest and Range Experiment Station, 1975), p. 85.

[35] Ibid., pp. iv and 6. The impact area estimate was developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana), based on unpublished base data.

[36] U.S. Department of Agriculture, Forest Service, Region 1, unpublished data (Missoula, Montana, May 1975).

Water Sources

The two rivers of the impact area are the Powder River, which runs to the northeast along the eastern boundary of the area, and the Tongue River, which runs to the north through the center of the area. Additional supplies are available in several lesser drainages such as Rosebud, Otter, Pumpkin, and Hanging Woman creeks, but they are much smaller in size and, at times, less available. None of these rivers or streams, however, has sufficient flow for industrial utilization without some form of flow control, such as dams or offstream storage. Table 2.18 summarizes the historical yields for the major rivers in the area. Information for the Yellowstone River is also included for comparison purposes and because the diversion of water from the Yellowstone through aqueducts to possible coal-processing sites in the study area has been discussed. The table indicates that both the Tongue and Powder rivers are much smaller

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[37] Paul E. Packer, *Rehabilitation Potentials and Limitations of Surface-Mined Land in the Northern Great Plains*, General Technical Report INT-14 (Ogden, Utah: USDA Forest Service, Intermountain Forest and Range Experiment Station, 1974).

Table 2.18

Historical Stream Yield at Selected Stations in the Yellowstone River System

(Acre-Feet per Year)

Station	Maximum Yield	Minimum Yield	Average Yield
Yellowstone River at Miles City	12,000,000	4,446,000	8,071,000
Yellowstone River at Billings	7,396,000	2,915,000	4,893,000
Powder River at Moorhead	NA	NA	325,300
Powder River near Locate	1,178,000	57,510	434,700
Tongue River at Montana-Wyoming border	NA	NA	354,300
Tongue River at Ashland	NA	NA	443,000
Tongue River at Miles City	525,900	41,450	293,400

Source: Montana Coal Task Force, *Coal Development in Eastern Montana* (Helena, Montana, January 1973), p. 43, citing U.S. Geological Survey, *Index of Surface Water Records, Part 6-Missouri River Basin,* Circular 656. Montana Department of Natural Resources and Conservation, Water Resources Division, *Catalogue of Stream Gaging Stations in Montana,* Inventory Series Report No. 6, revised (Helena, Montana, October 1972), p. 17.

Note: An acre-foot of water represents 43,560 cubic feet or 325,900 gallons.

NA denotes the data were not available.

than the Yellowstone and have sharply fluctuating water yields. Reporting stations on both rivers have recorded zero flows on a number of occasions.

The only existing major water storage facility is the Tongue River Reservoir located northeast of Decker and containing 40,000 acre-feet of dependable annual storage and a capacity of 69,440 acre-feet. The Montana Board of Natural Resources and Conservation has allocated 4,175 acre-feet per year to The Montana Power Company for industrial use. The remaining 35,825 acre-feet have been contracted for irrigation and cannot be converted to industrial use without the approval of the Department of Natural Resources and Conservation.[38] Water is released from the dam during the growing season and diverted by pumps or canals to the floodplain downstream as far as Miles City for agricultural use.

There are numerous other small dams and reservoirs in the area used for irrigation, stock water, and flood control. They are relatively small, none exceeding 50 acres, and serve only local users.[39]

Water also is available from wells and springs, but its quality and quantity vary considerably from site to site. Shallow wells generally yield less than 30 gallons per minute and are appropriate for only small irrigation projects and livestock. The wells are often contaminated with high mineral concentrations, making them unsuitable for most uses.[40]

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[38] Montana Coal Task Force, *Coal Development in Eastern Montana* (Helena, Montana, January 1973), p. 45.

[39] Montana Water Resources Board, *Montana Register of Dams,* Inventory Series No. 3 (Helena, Montana, 1968), pp. 2, 50, and 60.

[40] U.S. Department of the Interior, Bureau of Reclamation, *Report on Resources of Eastern Montana Basins* (Billings, Montana, August 1972), pp. 52-54.

Water Uses

Agriculture is the major water user. Water is used for crop irrigation, primarily along the water drainages of the area, and for livestock. Approximately 20,700 acres of land in the study area are irrigated and consume an average of about 52,000 acre-feet of water per year.[41] Of course, irrigation water requirements vary from year to year depending on rainfall and the exact mix of crops planted. Numerous small dams are scattered throughout the rangeland to catch water for cattle.

The domestic use of water is limited to private wells serving ranch units and the municipal wells for the communities in table 2.19. Approximately 300 acre-feet of water are used per year for municipal water supply--only a very small fraction of the water consumed in the area.

As we mentioned above, 4,175 acre-feet of water from the Tongue River Reservoir are presently reserved for industrial use, but there is no large-scale industrial use of water in the study area at this time.

Recreational uses of the water resource are detailed in the following section on recreation.

Outdoor Recreation

The dominant characteristic of the study area is wide-open space. The combination of vast open spaces, sparse population, and the absence of any well-known scenic attractions has resulted in only a modest development of tourism and outdoor recreational facilities. Detailed

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[41] Montana Department of Natural Resources and Conservation, unpublished data.

Table 2.19

Municipal Water Use in Selected Communities in the Impact Area

Community	Acre-Feet per Year[a]	Source
Ashland	19.3	1 well
Birney	11.7	1 well
Busby	53.7	3 wells
Lame Deer	217.7	3 wells
Total	302.4	

Source: Montana Department of Natural Resources and Conservation, unpublished data (Helena, Montana).

Notes: The data refer to groundwater use.

The impact area includes Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[a] An acre-foot of water represents 43,560 cubic feet or 325,900 gallons.

information on visitor use is not available for the area, but we will discuss the recreational attributes of the area and include some estimates where they are available. The largest recreational area in the impact area is the Ashland Division of the Custer National Forest. The recreational facilities of the Forest will be discussed in a later section.

Historic Sites

There are numerous historic sites in the study area associated primarily with events of the Indian wars from the early 1850s through the 1870s. Of particular importance are the sites of the Rosebud Battle, June 17, 1876; Battle of Hanging Woman Creek, January 7, 1877; Battle of Wolf Mountain, January 8, 1877; and Reynolds Campaign of March 1876. Old Fort Howe, in the Ashland Division of the Custer National Forest, was erected in 1876, and the remaining rock building is currently being preserved. Many archeological sites have been discovered in the area ranging from Indian burial grounds, buffalo jumps, eagle traps, and petroglyphs to arrowheads and teepee rings.

Water-Related Activities

With the exception of the Tongue River, a stretch of the Powder River, and the Tongue River Reservoir, water resources for recreation are extremely limited. Warm-water fishing on the rivers and the larger streams of the area is the predominant recreational use of the water in the area. Visitor days of fishing on the Tongue River are estimated at 1,150 per year, with 80 percent of them spent on the reservoir and the remaining 20 percent on the river below the dam.[42] The numerous irrigation ponds and small reservoirs in the area are often stocked with fish and offer water-oriented recreational opportunities, but most are on private land and are subject to the owners' restrictions. Boating is limited to the Tongue River Reservoir and the river immediately below the dam. The limited number of access points appears to be a deterrent to expanded usage of the waterways.[43] The recreational potential of the Powder River is considered low because of the limited flow of water in the summer.[44] However, this could change as a result of new reservoirs.

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[42] U.S. Department of the Interior, Bureau of Land Management, unpublished data.

Hunting

Hunting is the main recreational activity in the area and appears to be very popular with nonresidents.[45] The Bureau of Land Management has estimated that over half of the hunters are from outside the area.

Mule deer, whitetail deer, and antelope abound as well as upland game birds including ring-necked pheasant, wild turkey, grouse, and partridge. The abundance of game will continue to attract both resident and nonresident hunters to the area, although ranchers, wishing to reduce the impact of larger numbers of hunters, are tending to restrict access in some areas.[46]

Tourism

Although the impact area has an extensive recreational potential, little has been done to develop it. Hunting and fishing seem to be the activities which attract people from beyond the area's boundaries. The sizable distance to any population center, plus the lack of paved roads and food and lodging services in the area, are strong deterrents to tourism. As a result, day-use activities by residents of the area predominate, and nearness to home is an important factor in the choice of recreation areas.[47]

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[43] Montana State Fish and Game Commission, *Montana Statewide Outdoor Recreation Plan*, vol. 2 (Helena, Montana, n.d.), Region 3, p. 1.

[44] Ibid., p. 15.

[45] Ibid., p. 9.

[46] Ibid., p. 5.

Community Institutions and Public Services

As we have seen, the Decker-Birney-Ashland study area is composed of rural areas from three counties, sparsely populated, largely devoted to farming and ranching, and lacking any sizable towns or cities. Consequently, it is not surprising that the quantity and variety of public services available in the study area are quite limited. By public services we mean governmental services, such as police and fire protection, schools, and highways, and other services such as health care which may be provided by private or public organizations.

Before we look at the kinds of public services available in the area, it may be well to reflect for a moment on the fact that the demand for public services is not uniform throughout our society, nor should we expect it to be. The relative remoteness of the study area forms a large part of the lifestyle of its residents and while it may seem very inconvenient to a city dweller to drive fifty miles to a doctor, a rural resident may find it no more inconvenient than driving five miles through congested city traffic.

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[47] Ibid., p. 6.

The social relationships of residents of the study area are based on personal friendships among neighbors and family members and, other than activities centered around the schools in the area, there are no groups, organizations, or recreational activities which bring large numbers of residents together.

With the exceptions of local school districts and the tribal governments, there are no subcounty governmental units to provide services in the impact area. None of the towns are incorporated. Therefore, residents of the study area depend upon their respective county governments for basic services, such as law enforcement and road maintenance, and they travel outside the area to population centers, such as Hardin, Forsyth, Broadus, Billings, Miles City, and Sheridan, to receive specialized services, such as health care, and cultural activities. There are no cultural or indoor recreational facilities in the study area. Outdoor recreational opportunities are available on the Ashland Division of the Custer National Forest, but, with the exception of hunting, are not utilized much by local residents. The topography and recreational facilities of the Forest are much the same as the study area in general and do not offer much variation for study area residents from the recreational opportunities close to home.

Health Care

The study area is lacking in health care facilities and personnel, but residents appear to be able to obtain adequate health services from neighboring areas. The Indian Health Service operates an outpatient clinic at Lame Deer for the Indian residents of the area. The clinic is staffed by two doctors and several nurses.[48] The only other medical facility in the study area is a first aid station, which has recently been started in Ashland and which is staffed by nurses. A doctor from the Indian Health Service makes periodic visits to the Ashland station for general treatment.

Residents of the area must travel to nearby cities to obtain hospital care and medical specialty services. A sixteen-bed hospital is located in Hardin, but it only has one doctor and a physician's assistant.[49] The Indian Health Service at Crow Agency has a hospital with thirty-four beds and is available to Indian residents of the study area.[50] A new twenty-six-bed hospital in Forsyth, with coronary and intensive care units, serves most of Rosebud County.[51] Three physicians have practices in Forsyth. An eighty-one-bed hospital in Sheridan, Wyoming, with an eighteen-member medical staff, treats patients from several Wyoming counties and the residents of the southern part of the study area.[52] The Sheridan hospital is well equipped and staffed and apparently has the capability to substantially expand its services. Many residents of the study area prefer to travel further to the larger hospitals in Billings and Miles City.

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[48] U.S. Department of the Interior, Bureau of Reclamation, and Montana State University, Institute of Applied Research, *Anticipated Effects of Major Coal Development on Public Services, Costs and Revenues in Six Selected Counties*, prepared for the Northern Great Plains Resources Program (Bozeman, Montana, 1975), p. 21.

[49] Ibid., p. 16.

[50] Ibid., p. 21.

[51] Ibid., p. 16.

[52] Ibid., p. 20.

Social Services

Welfare and social work activities are administered by the county governments in the three counties with the most emphasis placed on the population centers of Hardin, Forsyth, Colstrip, and Broadus. A county welfare branch has been established in Lame Deer to provide assistance to Indian residents in conjunction with the Bureau of Indian Affairs welfare office.[53] Other than day care services and youth activities, available in Lame Deer and Ashland, there are no community centers or public-service-type organizations in the study area.

Fire Protection and Law Enforcement

Fire protection services in the study area are organized on a volunteer basis, often utilizing members of the sheriffs' departments and county road crews. An army surplus truck with a tank and pump is stationed in Decker.[54] The Rosebud County sheriff's department provides a volunteer force for rural fires and has five trucks to cover the county.[55] The U.S. Forest Service maintains crews and equipment to combat fires on the Ashland Division and the nearby areas. The Northern Cheyenne Reservation has a twenty-man volunteer fire force and three tank trucks located in Busby and Lame Deer.[56] Wyoming fire trucks are not allowed to respond to fire calls in Montana, leaving the southern portion of the impact area with limited fire protection.

Law enforcement in the study area is provided by the tribal police forces and the county sheriffs' departments. However, due to the large areas to be covered and the small staffs, police protection in the study area is limited. Rural police protection in Big Horn County is provided by a four-man sheriff's department.[57] Rosebud County and the City of Forsyth have a combined city-county law enforcement department with a deputy stationed in Ashland and one in Birney. The Northern Cheyenne Reservation has an eleven-member tribal police force stationed in Lame Deer and the Crow Reservation also has a separate police force.[58]

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[53] Ibid., p. 49.

[54] Ibid., p. 63.

[55] Ibid.

[56] Ibid., p. 66.

Public Transportation

Most of the roads in the impact area are gravel, with the exception of Highway 212, the main roads on the Northern Cheyenne Reservation, and the road between Decker and Sheridan. Inclement weather can made the roads in most areas difficult if not impassable. Residents of the study area must travel to Hardin, Forsyth, Broadus, or Sheridan to make connection with public transportation systems (rail, bus, airplanes). As a result, most residents provide their own transportation for regional travel. Light airplane travel is practical in the area, and several ranchers maintain small airstrips for their use.

Municipal Services

As we noted earlier, there are no incorporated towns in the study area. The municipal services which are available in the few rural communities are provided by county government or special improvement districts and are limited to basic needs. Even these are not always adequate.

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[57] Ibid., p. 68.

[58] Ibid., pp. 71-72.

The towns in the study area rely on underground wells for their water supply and use a relatively small amount of water. Lame Deer, Ashland, Busby, and Birney are at the point of needing improved water and sewer systems to avoid contamination of the municipal water supply. Solid wastes are disposed of by burning in landfill dumps which can create a nuisance to the local area around the dump.[59]

Big Horn and Rosebud counties have planning boards, but most residents of the study area feel wary of outside governmental interference with their lifestyles and property rights. Consequently, very little interest has developed in creating local planning groups or contributing to the countywide planning efforts. One member of the Rosebud County planning board is, however, from the Birney area. The only whom? local planning initiative has been the recent work of a small group in Ashland to establish a local sewer and water district to obtain help in improving their sewage system.

Schools

The Decker-Birney-Ashland impact area contains all or part of seventeen elementary school districts, with thirteen public and two private elementary schools.[60] The public schools are generally small--eleven of the thirteen have less than 20 students and the smallest has only two. The typical school has one teacher, a handful of students and a remote location. During the 1974-75 school year, the public elementary school at Lame Deer had about 330 students and the Ashland public school reported 90 students.[61]

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[59] U.S. Department of the Interior, Bureau of Land Management, unpublished data.

[60] This section is based on data obtained from Montana Superintendent of Public Instruction, *Montana Education Directory, 1974-75* (Helena, Montana, 1975).

The Northern Cheyenne Reservation has a tribal school at Busby which as about 225 elementary students and 100 high school students.[62] The St. Labre Mission at Ashland also runs a private grade and high school with 370 and 190 students, respectively.[63]

The two private high schools are the only secondary schools in the study area. Students who wish to attend public high schools commute to (or live in) Colstrip, Lodge Grass, Broadus, or Sheridan. The study area includes parts of four separate high school districts.

Ashland Division of the Custer National Forest

The Ashland Division of the Custer National Forest covers over a fifth of the study area and is the largest continuous area managed by one agency.[64] Because of its relative size and the physical and recreational resources it contains, we will discuss the Ashland Division separately.

General Description

The Ashland Division is composed of the remnants of an old plateau between the Tongue and Powder rivers. To the north, the ridges of the plateau are covered with open stands of Ponderosa pine. Further south, the topography opens into grassy upland ranges. Throughout the Division, the varying landscape, ranging from sandstone and multicolored shale buttes to rolling grassy prairies to forested ridges, gives an interesting and definitely "western" appearance to the area.

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[61] Ibid., pp. 91-92.

[62] Ibid., pp. 116-117.

[63] Ibid., pp. 116 and 118.

[64] The information in this section was derived from U.S. Department of Agriculture, Custer National Forest, unpublished data, except where noted otherwise.

The boundaries of the Ashland Division enclose 502,153 acres of land, of which 64,415 acres are owned by private individuals, leaving 437,738 acres which are administered by the U.S. Forest Service. Within the Division, the federal government holds the mineral rights to 474,637 acres.

Elevations vary from 3,000 feet at Ashland to 4,410 feet at Home Creek Butte, east of Ashland. The climate of the Division is cold in the winter (-20° to -40°F) and hot in the summer (100°+), with precipitation averaging approximately 12 inches per year in the lower elevations and 17 inches in the higher areas.

Timber

As we mentioned earlier, approximately 80,000 acres of the Ashland Division are timbered and the Forest Service estimates that 324 million board feet of timber are currently standing. Ponderosa pine is the predominant specie of trees in the Division. The annual timber cut has varied substantially from year to year:

Year	Amount Harvested (000 board feet)	Custer National Forest Sales Revenue
1966	70	$ 321.25
1967	723	3,223.38
1968	217	877.80
1969	1,028	6,761.73
1970	1,060	9,500.00
1971	66	188.60
1972	4,475	25,875.28
1973	10	100.00
1974	3,000	18,324.48

The low timber cut in 1973 reflects the closure of the Ashland sawmill to repair fire damage. The allowable timber cut for the Ashland Division is about 4 million board feet per year, substantially above the average actual cut for the last decade.

Only two sawmills (Lame Deer and Ashland) are located close to the Division, and fluctuations in their timber requirements have directly affected the timber cut in the Division. The distances to other mills are substantial, therefore bidding for timber sales on the Division has been primarily by the larger mill in Ashland. It appears that the annual timber demand from the remodeled Ashland mill will be several times the allowable timber cut of the Division. A 4-million-board-feet timber sale on the Division is now (June 1975) in the planning stages by Forest Service personnel.

Although the allowable cut of the Division is not large enough to supply all the raw material, the Division (along with the Northern Cheyenne Reservation) does make a positive contribution to the operations of the two mills in the study area, thereby supporting the employment of 70 to 80 people in the wood products industry.

Grazing

A grazing permit system has evolved over the years to allow private ranchers (permittees) adjacent to federal land in the Ashland Division to graze their stock on federal native ranges during the summer months. The public land is leased according to the forage production of the land measured in terms of animal unit months (AUMs). An AUM is the forage necessary to graze one cow and one calf, under six months old, for one month. The location and allocation of a particular grazing allotment to a permittee is influenced by prior use based on the location of the range headquarters, the natural way livestock use the range, and the availability of water and forage.

On the national forest lands of the Division, permittees are licensed for ten-year periods. Forest Service data indicate that eighty-two permittees were allocated 105,248 AUMs of forage, and actually grazed 17,408 head of cattle in 1974, generating approximately $150,000 in revenue to the Custer National Forest. Grazing information for the last four years indicates a slight decline in the number of permittees and the number of head grazed on the Division. The permittees' privately owned ranch units vary from 372 to 19,700 acres in area and from 20 to 1,400 head of cattle in herd size. The average number of acres required to support one cow for a seven-month grazing season on the Division is approximately 18 acres. The Forest Service charges a grazing fee of $1.23 per month per head; this charge is set by administrative policy and may not actually reflect the market value of the forage consumed. It is interesting to note that grazing use of the Division generates substantially more revenue for the Custer National Forest than timber cutting does.

Grazing on the national forest land enables the permittees to run much larger cattle herds than would be possible on the permittees' privately owned land. By grazing on leased land in the summer, permittees can devote their private land to cultivating high-yield hay crops for winter forage for their herds. Without grazing permits, it is doubtful whether many of the permittees could stay in business.

Recreation

Recreation on the Ashland Division is divided into two categories by the Forest Service: dispersed recreation and developed recreation.

The activities classified as dispersed recreation in the Division and their relative importance are:

Type of Activity	Percentage of Total Dispersed Recreation
Viewing	3
Auto driving	13
Motorcycling	5
Snowmobiling	5
Hiking	3
Horseback riding	7
Fishing	6
Hunting big game	40
Hunting small game and waterfowl	12
Other	6

Developed recreation includes the following:

Type of Activity	Percentage of Total Developed Recreation
General camping	41
Auto camping	17
Tent camping	5
Trailer camping	34
Picnicking	3

Recreational activity is estimated by the Forest Service in terms of recreation visitor days (RVDs). An RVD is defined as one visitor spending twelve hours in the Forest. The estimates of recreational usage for the Ashland Division are as follows:

Year	Dispersed Recreation (Visitor Days)	Developed Recreation (Visitor Days)
1969	12,000	12,200
1970	10,800	12,400
1971	9,300	12,600
1972	9,800	12,800
1973	10,400	13,000
1974	10,800	13,150
1975	11,000	13,300

Dispersed recreation, as its name implies, is pursued throughout the Division. The major activity is hunting which accounts for approximately 52 percent of the dispersed recreation usage and results in 50 percent of the dispersed recreation visitor days being spent in the fall. (Except for limited snowmobiling, most other activities occur in the summer.)

Developed recreation in the Division is limited to the three developed campgrounds: Redshale Campground, 5 acres; Whitetail Campground, 2 acres; and Cow Creek Campground, 3 acres. The majority of the campground usage is also during the fall hunting season.

Information about visitor usage is very sketchy. There are no data concerning the origin of the visitors of their length of stay, but indications are that the users tend to come from the nearby area and usually spend the day, returning home at night.[65] The exception is hunting where 50 percent of the users are nonresidents of Montana.

Coal

In addition to being located next to several large strippable coal deposits, the Ashland Division also has deposits of its own. The Forest Service estimates that 5.9 billion tons of strippable coal underlie approximately 145,000 acres of land in the Division. The amount of timber over these reserves is negligible because the timber is found generally on slopes greater than 12 to 20 percent and the strippable reserves are under the more gentle slopes by definition of "strippable."

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[65] Montana State Fish and Game Commission, *Montana Statewide Outdoor Recreation Plan*, Region 3, p. 6.

Summary

The Ashland Division makes a definite contribution to the study area's economy by supporting the wood products industry and agriculture through its timber sales and grazing leases. A portion of the Division revenue (25 percent of the net proceeds) from these activities is paid to the Rosebud and Powder River county governments in lieu of property taxes on federal land. The Division also provides recreational opportunities for residents of the region and apparently attracts a sizable number of hunters to the area from outside the area; however, it is doubtful the recreation activities create much employment for residents of the study area. The slow growth of recreational use of the Division is probably closely related to the very slow growth of the non-Indian population in the study area. It appears that most of the recreational use, with the exception of hunting, is by local residents.

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III

PROJECTED IMPACT OF COAL-RELATED DEVELOPMENT

This chapter discusses the probable impacts of alternative levels of coal development in the Decker-Birney-Ashland area on the population, income, and employment in the impact area and the seven counties.[1]

Four alternative levels, or scenarios, of coal development in the Decker-Birney-Ashland area have been developed by the U.S. Bureau of Land Management and were provided to us through the Montana Energy Advisory Council for the purposes of this study. The scenarios, as presented in detail later in table 3.2, are not based on concrete plans for development in the study area but are possible alternatives given the current trends in the national energy picture and possible technological developments in the next decade. The reader will note that they include only mining and gasification plants; none of the scenarios anticipates electric generating activities in the study area.

The projection methodology used in this report follows closely that used by Paul E. Polzin in his *Water Use and Coal Development in Eastern Montana*.[2] Small changes in the procedure and assumptions were required to overcome certain data deficiencies for the study area. Before we begin, we must reiterate that economic projections are only our best guesses as to the probable impacts of specified coal development. We will start with several assumptions about the levels of coal development, the level of technology in the coal industry, and the economic base of both the seven-county and impact areas and, from them, project the economic variables to 1980 and 1985. Two types of errors can occur: the underlying assumptions may be incorrect; or, the estimated impacts may be inaccurate. Economists have come a long way in improving the accuracy of predictions of this type. However, in the end, the accuracy of our forecast of the future depends upon human nature, which remains unpredictable.

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[1] This chapter was written with the technical assistance of Paul E. Polzin.

[2] Paul E. Polzin, *Water Use and Coal Development in Eastern Montana* (Missoula, Montana: University of Montana, Bureau of Business and Economic Research, 1974).

Coal Mining and Gasification: An Overview

To give the reader an idea of the magnitude of coal strip mines and gasification plants, table 3.1 includes a summary of the current technical information concerning surface mines and gasification plants. This information is not entirely based on hard fact, as mines and plants of this size are not yet operational in this country, so we had to rely on government and industry sources for "informed guesses" as to the technical relationships.

Table 3.1 reports that a mine producing about 10 million tons per year requires a capital investment of approximately $38 million and takes about two years to build. Construction employment, which is primarily concerned with assembling the dragline and other equipment, will average 200 workers on an annual basis, but during the seasonal peak may reach 250 workers. When fully operational a 10-million-ton mine will employ 220 workers earnings an average of $14,000 each, for a total payroll of just over $3 million a year at 1972-73 wage rates. Only a little water,

Table 3.1

An Overview of Coal Activities

	Subbituminous or Lignite Coal Surface Mine	Gasification Plant (Lurgi Process)
Capacity of mine or plant	10,000,000 tons/year	250,000,000 scfd[a]
Value of plant and equipment (1970-1972 prices)	$37,840,000	$350,000,000
Construction period (years)	2	3.5
Construction employment		
Peak employment	250	3,070[b]
Average annual	200	1,540[b]
Permanent employment	220	625[b]
Earnings of miners (at 1973 wage levels)		
Total annual	$ 3,080,000	$ 7,437,500[b]
Average per worker	$ 14,000	$ 11,900[b]
Coal consumed (tons per year)	---------	8,000,000
Acres disturbed (per year)	114-285	91-228[c]
Water use (acre-feet per year)[d]	---------[e]	10,000

Source: Paul E. Polzin, Water Use and Coal Development in Eastern Montana (Missoula, Montana: University of Montana, Bureau of Business and Economic Research, 1974), table 3.1, p. 91, citing unpublished base data from the Bureau of Business and Economic Research and other sources.

[a] Standard cubic feet per day (scfd).

[b] Excluding associated coal mine.

[c] Associated coal mining operation only.

[d] An acre-foot of water represents 43,560 cubic feet or 325,900 gallons.

[e] Negligible.

used primarily to reduce dust, will be consumed. The number of acres disturbed by surface mining depends on the thickness of the coal seam. (The lower value, 114 acres per year, corresponds to the Decker field.) These estimates are based on the average seam thickness; the number of acres disturbed in any one year may be above or below these estimates.

Surface mining operations utilize large earthmoving equipment and resemble heavy construction work more than underground mining. For this reason, surface mines employ heavy equipment operators, truck drivers, and equipment maintenance personnel.

Based on proposed gasification plants in North Dakota, Wyoming, and New Mexico, and on the educated guesses of government personnel, we estimate that a 250-million standard cubic feet per day (SCFD) gasification plant would cost approximately $350 million and require three and one-half years to build. The average construction employment would be 1,540 workers, but during short periods might exceed 3,000. When operational this plant would employ about 625 workers (excluding coal miners) with average earnings of $11,900 per year, for a total payroll of approximately $7.5 million at 1973 wage rates. Given the characteristics of Montana coal, about 8 million tons a year would be consumed by the plant, which we will assume comes from an adjacent mine. Based on the proposed plants for North Dakota and New Mexico, we believe that 10,000 acre-feet of water per year is a reasonable estimate of the plant's water requirement for cooling purposes.

There are several important conclusions that can be reached with just the simple data presented here: 1) the coal mining and processing activities likely to locate in Montana are very efficient, automated, and expensive; and 2) in terms of additional jobs and income, one gasification plant dwarfs the impact of a surface mine. Its 625 employees, excluding associated coal miners, are almost three times the number of workers in a 10-million-ton mine. The gigantic scale of gasification is emphasized by the fact that one plant costs roughly ten times more than a surface mine.

Future Levels of Coal Development

The alternative levels of coal development considered in this report, and detailed in table 3.2, vary considerably. Scenario I consists of only one surface mine operating in both 1980 and 1985 with an annual production of 13 million tons per year to be exported from the impact area. This scenario is based loosely on the expected expansion of the existing mine at Decker from its 1974 production level of approximately 7 million tons. Scenario II anticipates two surface mines by 1980 with a total export production of 17 million tons per year, and three mines by 1985 with an export production of 26 million tons, plus a 250-million SCFD gasification plant with an 8-million-ton surface mine to supply it.

The third scenario is the most extensive development prediction. Scenario III calls for one 13-million-ton export mine in 1980, five mines with a total export production of 53 million tons by 1985, and two gasification plants by 1980 with their associated 8-million-ton supply mines.

The final alternative, Scenario IV, includes no gasification plants, but does include two export mines in 1980, with a total production of 25 million tons, and three mines in 1985 producing 35 million tons of coal per year.

Whether or not there will be gasification plants in Montana is problematic. There have, as yet, been no formal applications for

Table 3.2

Projected Alternative Levels of Coal Development in the Impact Area 1980 and 1985

	1980	1985
Scenario I		
Coal production	13	13
Export	13	13
Gasification	0	0
Gasification plants	0	0
Scenario II		
Coal production	17	34
Export	17	26
Gasification	0	8
Gasification plants	0	1
Scenario III		
Coal production	29	69
Export	13	53
Gasification	16	16
Gasification plants	2	2
Scenario IV		
Coal production	25	35
Export	25	35
Gasification	0	0
Gasification plants	0	0

Source: U.S. Department of the Interior, Bureau of Land Management, unpublished data (Billings, Montana), and University of Montana, Bureau of Business and Economic Research, unpublished base data (Missoula, Montana).

Note: Coal production is expressed in millions of tons, and individual gasification plant size is assumed to be 250 million standard cubic feet per day (scfd).

gasification plants in the state. Given the estimated construction period of three and one-half years and the necessary delays associated with the various permits, it is doubtful that any gasification plants could be in operation by 1980.

Projection Methodology

Any projection method, no matter how technical and complex, depends crucially on the accuracy of the initial assumptions. It is these assumptions, along with a brief overview of some of the procedures, which will be discussed in this section.

A small economy may be conceptually divided into primary and derivative sectors. The primary sector consists of those industries which sell their products outside the area or are otherwise influenced by events occurring beyond the region under study. These activities are sometimes denoted as "export" industries; examples are agriculture, certain types of manufacturing, railroads, and mining. The derivative sector includes industries which are oriented toward serving the local population, such as retail trade, services, and local government.

The derivative sector depends, to a great extent, on developments in the primary sector. Conceptually, export industries sell their products elsewhere and are responsible for a net injection of "new" money into the area's economy. A large portion of these funds are paid to workers who then buy goods and services from local merchants. As these "export dollars" are spent and respent in the local economy they create additional income and earnings in the derivative industries.

The relationship between income in the derivative and primary sectors was estimated by using data for the last decade (1960-1972). The primary sector was represented by nonagricultural "export" earnings and gross farm receipts. The historical values were then modified in light of changes in the shopping habits we believe will accompany coal development. Agriculture was separated from other export industries and treated separately because we feel farm earnings (proprietors' income plus the wages and salaries of hired employees) are not related to derivative earnings in the same manner as other export industries. Because most agricultural products are sold in the latter part of the year, for example, these sales may not influence agricultural spending until the following year.

The relationships between the primary and derivative sectors which we believe appropriate for analysis of coal-related development are summarized in table 3.3. Separate values were estimated for the study area and the seven counties. Sufficient data were not available to estimate the relationship for the study area solely from the data for that area. Therefore the estimates for the three-county area of Big Horn, Powder River, and Rosebud counties were used for the smaller area. The estimates are, no doubt, too high for the economy of the study area as it currently exists, since there are few opportunities to spend incomes within the area. However, if any community of comparable size to Hardin or Forsyth develops in the area we feel similar spending patterns will develop, and the relationship between the derivative and primary sectors in the study area will be quite close to that for the three-county area.

The study area values are smaller than for the seven counties, implying that the economic effect is much larger in the entire trade area than in the immediate impact area. The seven-county area includes the cities of Billings and Miles City which offer a much greater selection and quantity of goods and services than the study area. For the study

Table 3.3

Relationship between Primary and Derivative Sectors in the Impact Area and Seven-County Area

	Impact Area[a]	Seven-County Area[b]	[illegible]
Change in derivative earnings for each dollar ($1.00) change in:			
Earnings of coal-related workers	$0.50	$1.40	.8
Gross farm receipts	0.15	0.50	.2

Source: Paul E. Polzin, Water Use and Coal Development in Eastern Montana (Missoula, Montana: University of Montana, Bureau of Business and Economic Research, 1974), table 3.3, p. 102.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

area, each dollar increase in earnings of coal-related workers will increase derivative earnings (wages and salaries of shopkeepers, clerks, craftsmen, etc.) by $0.50. A change of $1.00 in gross farm receipts will change derivative earnings by $0.15. Earnings in derivative industries in the seven counties will increase by $1.40 for each $1.00 increase in earnings of coal-related workers, and by $0.50 for each $1.00 increase in gross farm receipts.

The procedure for estimating the economic impact of coal-related development can be summarized in five steps. 1) The amount of coal mined and the number of gasification plants in operation during 1980 and 1985 were taken from table 3.2. 2) Using a number of technical sources, coal-related employment and earnings associated with each development scenario were computed. 3) The decrease in gross farm receipts due to surface mining was estimated. 4) Using the values presented in table 3.3, the net effect of these changes on total derivative earnings was computed. 5) Derivative employment was estimated using average earnings per derivative worker developed in an earlier study.

Our projections of earnings, population, and income do not include the impact of royalties and other payments to resource owners. We have omitted them for two reasons: 1) there are no reliable estimates of their value; and 2) even if the dollar value were known, the royalty payments will often represent "windfall" or "one-shot" payments which may be spent or saved in ways quite different from ordinary income.

The economic projections are based on a number of very specific assumptions. 1) All the facilities listed in table 3.2 will be fully operational during the year shown and there will be no construction activity on other projects. We have not ignored the impact of construction, but we have chosen to discuss it separately. 2) We assume that none of the railroad workers associated with the export of coal will live in the Decker-Birney-Ashland area. Indications are that unit train crews would be based in Forsyth, Glendive, or in Wyoming, with only a few maintenance workers strung out along the rights-of-way. 3) Changes in earnings and productivity will follow the national trends in coal-related industries. 4) Land disturbed for surface mine operations will not be reclaimed for agricultural use prior to 1986. Since the success of reclamation projects is still being evaluated we have chosen one of the worst possible outcomes: that agricultural land will not be put back into production. 5) Each acre of land disturbed by surface mining will decrease gross farm receipts by $30 per year (in constant 1970 dollars). 6) Farm earnings will be about 60 percent of gross farm receipts.

The last major assumption concerns the future residence distribution of the coal workers. Due to the proximity of Wyoming to the southern portion of the study area, many of the coal workers may choose to reside in Wyoming. Such a pattern has emerged among the workers at the existing Decker mine, with many of them commuting a few miles from the city of Sheridan. Therefore, we have made two assumptions about the future residence distribution of the coal workers and will make two sets of projections for each scenario in table 3.2 based on these assumptions. The first assumes that all coal workers (miners and gasification workers) will live and spend in the study area. The second assumes that 50 percent of these workers will live in Wyoming and spend nothing in Montana. To some extent, northern Wyoming and Sheridan are supplied by Billings, so, theoretically, even if a sizable proportion of workers live in Wyoming there would be secondary impacts on the seven-county area (primarily

Billings). But we will assume there is no impact; therefore, the 50 percent nonresident assumption will give a low estimate of the economic impact, given the residence distribution.

Coal-Related Employment and Earnings

Projections of primary and derivative employment and earnings associated with coal-related development are presented in tables 3.4 through 3.11. Two tables are included for each scenario in table 3.2; they differ only in the assumption about the residence distribution of coal workers. For example, table 3.4 contains the employment and earnings projections for Scenario IA, assuming 100 percent of the coal workers will live in the study area, and table 3.5 contains the projections for Scenario IB, which assumes 50 percent of the employees will live in Wyoming.

Before we examine the projections we should establish a few guidelines for interpretation. These figures represent only the jobs and earnings created directly or indirectly by coal-related activity located within the study area. The effects of possible coal development in other sections of the seven-county area are not considered in this study. These projections represent our best guess as to what will happen, but they are just that--a guess--and should be treated as such. We have decided not to round off the various figures further than the nearest hundred dollars to avoid introducing rounding errors but caution the reader against inferring an unwarranted degree of precision--to the last employee or hundred dollars. Finally we have not attempted to project the rate of inflation. All dollar figures have been converted to constant 1970 dollars.

Scenario I

Tables 3.4 and 3.5 present the projections of coal-related employment and earnings for Scenario I under each of the two residence assumptions. To briefly review, Scenario I projects the coal production of one export mine to the 13-million-ton level for 1980 and 1985.

Scenario IA (table 3.4) projects the coal mining employment in 1980 to be 270, with earnings of $3,966,000 in constant 1970 dollars. By 1985 coal-related employment will have dropped slightly to 250 but earnings will be $4,150,000. Although coal production is projected at the same level in 1980 and 1985, employment will drop slightly due to increased productivity; total earnings will increase because of increases in miners' wages.

A summary of the negative impact on agriculture is also shown in table 3.4. If there is no successful reclamation, we estimate that about 1,400 acres will have been removed from agricultural production by 1980 and 2,844 acres by 1985.[3] At $30 per acre, this implies an annual decrease in gross farm receipts of $42,000 in 1980 and $85,300 in 1985. This will lower farm earnings by $25,200 and $51,200 per year, respectively, in 1980 and 1985.[4] We have not estimated the decline in agricultural employment for any of the scenarios because of the small number of acres disturbed relative to the total agricultural land in the area and the likelihood that the acreage will be divided among a number of ranches, making the effect on employment very difficult to predict.

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[3] Based on an average of 45,000 tons of coal per acre, or roughly 22 acres disturbed for every million tons mined. This estimate is low for the Decker area (about 76,000 tons per acre) and high for the Kirby, Birney, Hanging Woman, and Moorhead areas (22,000-40,000 tons per acre).

[4] Assuming an earnings receipts/ratio of .60. This is based on the historical relationship between agricultural receipts and earnings for the three-county area between 1965 and 1972.

Table 3.4

Projected Employment and Earnings under Scenario 1A in the Impact Area and Seven-County Area 1980 and 1985

	Projected 1980		Projected 1985	
	Employment	Earnings[a]	Employment	Earnings[a]
Coal-related industries	270	$3,996,000	250	$4,150,000
Montana residents	270	3,996,000	250	4,150,000
Nonresidents	0	0	0	0
Mining	270	3,996,000	250	4,150,000
Export	270	3,996,000	250	4,150,000
Gasification	0.	0	0	0
Gasification plants	0	0	0	0
Impact on agriculture				
Acres disturbed (cumulative from 1972)	1,400		2,844	
Change in farm receipts per year[a]	-$42,000		-$85,300	
Change in farm earnings per year[a]	-$25,200		-$51,200	
Derivative industries				
Impact area[b]	259	1,991,700	227	2,062,200
Seven-county area[c]	680	5,573,400	607	5,767,300
All industries				
Impact area[b]	529	5,962,500	477	6,161,000
Montana residents	529	5,962,500	477	6,161,000
Nonresidents	0	0	0	0
Seven-county area[c]	950	9,544,200	857	9,866,100
Montana residents	950	9,544,200	857	9,866,100
Nonresidents	0	0	0	0

[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

The employment and earnings in the derivative industries were estimated using anticipated earnings in coal-related activity of the Montana residents (in the case of Scenario IA, all of the coal-related employment), the impact on agricultural income, and the relationships summarized in table 3.3. It should be emphasized that derivative positions are only abstractly associated with coal development. They will be indistinguishable from other jobs in retail trade, services, and local government. That is, they will cater to the entire population, not just coal-related workers.

We estimate that under Scenario IA an additional 259 derivative jobs, indirectly dependent upon coal activity, will be created in the study area and this will decrease slightly to 227 jobs in 1985. The impact on the seven-county area, which includes the wholesalers and suppliers in Billings and Miles City, will be much larger: 680 derivative jobs in 1980, and 607 jobs in 1985.

The projected growth in the derivative sector may seem large in light of the number of new jobs estimated in the primary industries. Two factors help to explain this. First, many of the derivative job opportunities will be in retail trade and services which are often part time and low paying. Second, the new primary jobs are "high-powered" jobs. That is, their annual earnings are between \$12,000 and \$16,000 using current wage scales; this compares to an average of about \$9,500 per year for workers in existing primary industries.[5] One would, then expect a relatively large impact per worker associated with coal-related employment.

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[5] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System, unpublished data (Washington, D.C., 1973).

In summary, we project that the direct and indirect coal-related employment for the study area will total 529 in 1980 and 477 in 1985. Coal-related and derivative earnings, after allowing for the negative impact on agriculture, will be $5,962,500 in 1980 and $6,161,000 in 1985. Similarly, in the seven-county area we project employment of 950 in 1980 and 857 in 1985. Coal-related and derivative earnings, net of the agricultural impact, will be $9,544,200 and $9,866,100, respectively (in 1970 dollars).

Scenario IB (table 3.5) differs from Scenario IA only in the assumption about the residence distribution of the coal-related workers. Therefore, the projections for coal mining employment and earnings and the negative impact on agriculture remain unchanged from Scenario IA. However, the total direct coal-related employment and earnings are split between the employees residing and spending in Montana and those residing in Wyoming (denoted as nonresidents in tables 3.4-3.11). In 1980, 135 of the primary coal industry employees will live and spend their earnings, totaling $1,998,000, outside Montana; and, in 1985, 125 employees will remove $2,075,000 in coal mining earnings from the state. The effect of the transfer of one-half of the coal-related earnings from the Montana economy is quite noticeable. Not only would the primary coal-related earnings of Montana residents be lowered by half, but also the impacts on derivative earnings of Montana residents in the study area and the seven counties would be roughly halved. To the extent that coal-related incomes of the nonresidents are not spent in the Montana economy, they are not able to generate derivative incomes for Montana residents. However, the loss of income to Montanans may be offset somewhat by Wyoming purchases of goods from Billings wholesalers. Under Scenario IB we project that the total direct and indirect coal-related employment for

Table 3.5

Projected Employment and Earnings under Scenario 1B in the Impact Area and Seven-County Area 1980 and 1985

	Projected 1980		Projected 1985	
	Employment	Earnings[a]	Employment	Earnings[a]
Coal-related industries	270	$3,996,000	250	$4,150,000
Montana residents	135	1,998,000	125	2,075,000
Nonresidents	135	1,998,000	125	2,075,000
Mining	270	3,996,000	250	4,150,000
Export	270	3,996,000	250	4,150,000
Gasification	0	0	0	0
Gasification plants	0	0	0	0
Impact on agriculture				
Acres disturbed (cumulative from 1972)	1,400		2,844	
Change in farm receipts per year[a]	-$42,000		-$85,300	
Change in farm earnings per year[a]	-$25,200		-$51,200	
Derivative industries				
Impact area[b]	129	992,700	113	1,024,700
Seven-county area[c]	339	2,776,200	301	2,862,300
All industries				
Impact area[b]	399	4,963,500	363	5,123,500
Montana residents	264	2,965,500	238	3,048,500
Nonresidents	135	1,998,000	125	2,075,000
Seven-county area[c]	609	6,747,000	551	6,961,100
Montana residents	474	4,749,000	426	4,886,100
Nonresidents	135	1,998,000	125	2,075,000

[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Montana residents in the study area will be 264 in 1980 and 238 in 1985, with earnings of $2,965,500 and $3,048,500, respectively. For the seven-county area 474 Montana residents will hold coal-related jobs with earnings of $4,749,000 in 1980, dropping slightly to 426 jobs in 1985 with total earnings of $4,886,100.

Scenario II

Scenario II predicts a total export coal production during 1980 of 17 million tons per year from two surface mines in the study area and an increase to 26 million tons per year from three mines in 1985. In addition, a 250-million-SCFD gasification plant and an 8-million-ton-per-year surface mine, to supply coal to the plant, are scheduled for operation in 1985.

Gasification plants require rather large number of workers. Scenario IIA (table 3.6) projects direct coal-related employment of 353 in 1980 and 1,280 in 1985. Of the latter, approximately 779 will be employed because of gasification: 625 workers in the plant, along with 154 extra coal miners needed to supply the raw material. Total direct coal-related earnings are projected to be $5,224,400 in 1980 and $19,810,500 in 1985. Approximately $11,493,900 of the earnings in 1985 are attributable to the gasification plant and its related mine.

As surface mine production increases, more acres of land are disturbed, resulting in a larger negative effect on farm earnings. By 1980, 1,667 acres may have been disturbed causing a loss of $30,000 in farm earnings. The cumulative acreage may climb to 4,378 by 1985 with a loss of $78,800 in farm earnings annually.

The effect on derivative employment and earnings in the study area is projected to be 338 jobs and $2,604,700 in earnings in 1980, and 1,086

Table 3.6

Projected Employment and Earnings under Scenario IIA
in the Impact Area and Seven-County Area
1980 and 1985

	Projected 1980 Employment	Projected 1980 Earnings[a]	Projected 1985 Employment	Projected 1985 Earnings[a]
Coal-related industries	353	$5,224,400	1,280	$19,810,500
Montana residents	353	5,224,400	1,280	19,810,500
Nonresidents	0	0	0	0
Mining	353	5,224,400	655	10,873,000
Export	353	5,224,400	501	8,316,600
Gasification	0	0	154	2,556,400
Gasification plants	0	0	625	8,937,500
Impact on agriculture				
Acres disturbed (cumulative from 1972)	1,667		4,378	
Change in farm receipts per year[a]	-$50,000		-$131,300	
Change in farm earnings per year[a]	-$30,000		-$ 78,800	
Derivative industries				
Impact area[b]	338	2,604,700	1,086	9,885,500
Seven-county area[c]	889	7,289,200	2,913	27,669,000
All industries				
Impact area[b]	691	7,799,100	2,366	29,617,200
Montana residents	691	7,799,100	2,366	29,617,200
Nonresidents	0	0	0	0
Seven-county area[c]	1,242	12,483,600	4,193	47,400,700
Montana residents	1,242	12,483,600	4,193	47,400,700
Nonresidents	0	0	0	0

[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

jobs with $9,885,500 in earnings for 1985. The total number of derivative jobs in the seven-county area will be 889 in 1980 and 2,913 in 1985 with respective earnings of $7,289,200 and $27,669,000.

In summary, we project that the total number of direct and indirect jobs and total earnings (net of the effect on agriculture) associated with Scenario IIA in the seven counties will be 1,242 and $12,483,600 in 1980 and 4,193 and $47,400,700 in 1985. In the study area, there will be 691 jobs and $7,799,100 in earnings during 1980; by 1985 we project these values will grow to 2,366 and $29,617,200, respectively.

Table 3.7 presents the projections of coal-related employment and income for Scenario IIB. Note that earnings taken out of the state by the nonresident employees reduces both the direct coal-related and derivative earnings of Montana residents by about half. The total effect of coal development on employment and earnings of Montana residents in the study area is projected to be 346 jobs and $3,880,800 in earnings in 1980 and 1,182 jobs in 1985 with earnings of $14,759,400. For the Montana residents of the seven-county area we project 620 jobs and earnings of $6,214,200 in 1980, and 2,093 jobs earning $23,628,200 in 1985.

Scenario III

Of the four alternative levels of coal development studied in this report, Scenario III is the most extensive, calling for one 13-million-ton-per-year export mine, two 250-million-SCFD gasification plants, and two 8-million-ton-per-year mines, to supply coal for gasification, by 1980. Four additional export mines, at 10 million tons per year each, are projected by 1985.

If we assume all of the coal-related workers will live in the study area then table 3.8 presents our projections of the effect on employment

Table 3.7

Projected Employment and Earnings under Scenario IIB
in the Impact Area and Seven-County Area
1980 and 1985

	Projected 1980		Projected 1985	
	Employment	Earnings[a]	Employment	Earnings[a]
Coal-related industries	353	$5,224,400	1,280	$19,810,500
Montana residents	177	2,612,200	640	9,905,300
Nonresidents	176	2,612,200	640	9,905,200
Mining	353	5,224,400	655	10,873,000
Export	353	5,224,400	501	8,316,600
Gasification	0	0	154	2,556,400
Gasification plants	0	0	625	8,937,500
Impact on agriculture				
Acres disturbed (cumulative from 1972)	1,667		4,378	
Change in farm receipts per year[a]	-$50,000		-$131,300	
Change in farm earnings per year[a]	-$30,000		-$ 78,800	
Derivative industries				
Impact area[b]	169	1,298,600	542	4,932,900
Seven-county area[c]	443	3,632,000	1,453	13,801,700
All industries				
Impact area[b]	522	6,493,000	1,822	24,664,600
Montana residents	346	3,880,800	1,182	14,759,400
Nonresidents	176	2,612,200	640	9,905,200
Seven-county area[c]	796	8,826,400	2,733	33,533,400
Montana residents	620	6,214,200	2,093	23,628,200
Nonresidents	176	2,612,200	640	9,905,200

[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 3.8

Projected Employment and Earnings under Scenario IIIA
in the Impact Area and Seven-County Area
1980 and 1985

	Projected 1980		Projected 1985	
	Employment	Earnings[a]	Employment	Earnings[a]
Coal-related industries	1,852	$24,784,600	2,579	$39,936,400
Montana residents	1,852	24,784,600	2,579	39,936,400
Nonresidents	0	0	0	0
Mining	602	8,909,600	1,329	22,061,400
Export	270	3,996,000	1,021	16,948,600
Gasification	332	4,913,600	308	5,112,800
Gasification plants	1,250	15,875,000	1,250	17,875,000
Impact on agriculture				
Acres disturbed (cumulative from 1972)	1,756		6,956	
Change in farm receipts per year[a]	-$52,700		-$208,700	
Change in farm earnings per year[a]	-$31,600		-$125,200	
Derivative industries				
Impact area[b]	1,608	12,384,400	2,191	19,936,900
Seven-county area[c]	4,228	34,672,100	5,874	55,806,600
All industries				
Impact area[b]	3,460	37,137,400	4,770	59,748,100
Montana residents	3,460	37,137,400	4,770	59,748,100
Nonresidents	0	0	0	0
Seven-county area[c]	6,080	59,425,100	8,453	95,617,800
Montana residents	6,080	59,425,100	8,453	95,617,800
Nonresidents	0	0	0	0

[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

and earnings. The relative magnitude of this scenario can be quickly grasped by comparing Scenario IIIA and Scenario IA. For example, the projected 1985 employment of 4,770 and earnings of $59,748,100 for the study area under the assumptions of Scenario IIIA are about ten times the comparable projections for Scenario IA. In the seven-county area 6,080 direct and indirect coal-related jobs with earnings of $59,425,100 are projected for 1980. By 1985 the employment impact will have grown to 8,453 jobs, earning $95,617,800.

Projections for Scenario IIIB, assuming 50 percent of the direct coal-related workers live outside the study area, are presented in table 3.9. As in the previous scenarios, the employment and earnings impact on Montana residents in the two areas are about half of the impacts projected under the alternative residence assumption.

Scenario IV

Scenario IV projects the impacts of coal development for export purposes only and does not provide for any local gasification plants. Two export surface mines are projected for 1980, one at 15 million tons per year and the other at 10 million tons per year. An additional 10-million-tons-per-year export mine is added to the scenario for 1985.

Table 3.10 includes the projections for employment and earnings for Scenario IVA. Coal-related employment is projected to be 519 in 1980 and 674 in 1985 with earnings of $7,681,200 and $11,188,400, respectively. These primary jobs and earnings will support an additional 497 derivative jobs in the study area in 1980 and 612 in 1985, increasing earnings by $3,831,300 and $5,569,400. For the seven-county area as a whole, 1,308 derivative jobs with earnings of $10,722,700 will be created by 1980, and will increase to 1,640 and $15,581,100 in 1985.

Table 3.9

Projected Employment and Earnings under Scenario IIIB In the Impact Area and Seven-County Area 1980 and 1985

	Projected 1980		Projected 1985	
	Employment	Earnings[a]	Employment	Earnings[a]
Coal-related Industries	1,852	$24,784,600	2,579	$39,936,400
Montana residents	926	12,392,300	1,290	19,968,200
Nonresidents	926	12,392,300	1,289	19,968,200
Mining	602	8,909,600	1,329	22,061,400
Export	270	3,996,000	1,021	16,948,600
Gasification	332	4,913,600	308	5,112,800
Gasification plants	1,250	15,875,000	1,250	17,875,000
Impact on agriculture				
Acres disturbed (cumulative from 1972)	1,756		6,956	
Change in farm receipts per year[a]	-$52,700		-$208,700	
Change in farm earnings per year[a]	-$31,600		-$125,200	
Derivative industries				
Impact area[b]	804	6,188,200	1,094	9,952,800
Seven-county area[c]	2,113	17,322,900	2,932	27,851,100
All industries				
Impact area[b]	2,656	30,941,200	3,673	49,764,000
Montana residents	1,730	18,548,900	2,384	29,795,800
Nonresidents	926	12,392,300	1,289	19,968,200
Seven-county area[c]	3,965	42,075,900	5,511	67,662,300
Montana residents	3,039	29,683,600	4,222	47,694,100
Nonresidents	926	12,392,300	1,289	19,968,200

[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

Table 3.10

Projected Employment and Earnings under Scenario IVA in the Impact Area and Seven-County Area 1980 and 1985

	Projected 1980 Employment	Projected 1980 Earnings[a]	Projected 1985 Employment	Projected 1985 Earnings[a]
Coal-related industries	519	$ 7,681,200	674	$11,188,400
Montana residents	519	7,681,200	674	11,188,400
Nonresidents	0	0	0	0
Mining	519	7,681,200	674	11,188,400
Export	519	7,681,200	674	11,188,400
Gasification	0	0	0	0
Gasification plants	0	0	0	0
Impact on agriculture				
Acres disturbed (cumulative from 1972)	2,067		5,511	
Change in farm receipts per year[a]	-$62,000		-$165,300	
Change in farm earnings per year[a]	-$37,200		-$ 99,200	
Derivative industries				
Impact area[b]	497	3,831,300	612	5,569,400
Seven-county area[c]	1,308	10,722,700	1,640	15,581,100
All industries				
Impact area[b]	1,016	11,475,300	1,286	16,658,600
Montana residents	1,016	11,475,300	1,286	16,658,600
Nonresidents	0	0	0	0
Seven-county area[c]	1,827	18,366,700	2,314	26,670,300
Montana residents	1,827	18,366,700	2,314	26,670,300
Nonresidents	0	0	0	0

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[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

The impact on employment in both the primary and derivative industries for the seven-county area will total 1,827 in 1980 and 2,314 in 1985. Coal-related and derivative earnings, after allowing for the negative impact on agriculture, will be $18,366,700 in 1980 and $26,670,300 in 1985. Similarly, for the impact area we project employment of 1,016 in 1980 and 1,286 in 1985. Coal-related and derivative earnings, net of agricultural declines, will be $11,475,300 and $16,658,600, respectively.

Scenario IVB, presented in table 3.11, projects that with half the workers living in Wyoming, the total coal-related and derivative employment and earnings of Montana residents in the study area will be reduced to 508 jobs with earnings of $5,714,400 in 1980 and 642 jobs earning $8,267,300 in 1985. For the seven-county area, 912 Montana residents will be employed in coal-related primary and derivative jobs in 1980 earning a total of $9,149,200; by 1985 employment will rise to 1,153 with earnings of $13,244,200.

Total Employment, Population, and Income

Tables 3.4 through 3.11 have summarized the projections of the direct and indirect effects of the alternative levels of coal development. However, they do not give the full picture; that is, how the coal-related activities will fit into the overall economy. To do this, projections for the sectors unrelated to coal are required. We have chosen to use a set of standardized regional economic projections called OBERS (an acronym for the two funding agencies, Office of Business Economics of the U.S. Department of Commerce and the Economic Research Service of the Department of Agriculture) to represent conditions in the other sectors of the local economy. They were prepared during the late sixties, before the

Table 3.11

Projected Employment and Earnings under Scenario IVB
In the Impact Area and Seven-County Area
1980 and 1985

	Projected 1980		Projected 1985	
	Employment	Earnings[a]	Employment	Earnings[a]
Coal-related industries	519	$ 7,681,200	674	$11,188,400
Montana residents	260	3,840,600	337	5,594,200
Nonresidents	259	3,840,600	337	5,594,200
Mining	519	7,681,200	674	11,188,400
Export	519	7,681,200	674	11,188,400
Gasification	0	0	0	0
Gasification plants	0	0	0	0
Impact on agriculture				
Acres disturbed (cumulative from 1972)	2,067		5,511	
Change in farm receipts per year[a]	-$62,000		-$165,300	
Change in farm earnings per year[a]	-$37,200		-$ 99,200	
Derivative industries				
Impact area[b]	248	1,911,000	305	2,772,300
Seven-county area[c]	652	5,345,800	816	7,749,200
All industries				
Impact area[b]	767	9,555,000	979	13,861,500
Montana residents	508	5,714,400	642	8,267,300
Nonresidents	259	3,840,600	337	5,594,200
Seven-county area[c]	1,171	12,989,800	1,490	18,838,400
Montana residents	912	9,149,200	1,153	13,244,200
Nonresidents	259	3,840,600	337	5,594,200

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[a] In 1970 dollars.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

current emphasis on coal development, and may be interpreted as projections of trends in the absence of coal-related development. The U.S. Department of Commerce, Bureau of Economic Analysis, made a special computer run to obtain the OBERS projections for the seven counties. No separate estimates were made for just the four census county divisions in the study area.

The OBERS projections for employment and income in the seven-county area will be used as an indicator of what would have happened in the absence of coal development and as a base in deriving the economy-wide totals for the alternative levels of development. We will add our estimates of coal-related employment and earnings to those prepared by the OBERS to obtain economy-wide totals. This procedure assumes that coal development and the other sectors of the economy are independent, that their sum represents the total economy. Agriculture is the major export industry affected by coal development, and we have included this impact in our previous projections.

Although the OBERS projections were made several years ago we feel they are still appropriate to use as a base since, other than coal, there have been no recent events in the area which would significantly modify the future trends as preceived in 1970.

Projections of total employment in 1980 and 1985, along with historical figures for 1970, are presented in table 3.12.[6] The projections from OBERS are presented as the "no coal development" alternative. The estimates for each of the scenarios were derived by adding the OBERS projection to the totals for coal activity shown in tables 3.4 thorugh 3.11.

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[6] These 1970 employment figures are not comparable with the 1970 census figures presented in earlier text and tables (tables 2.13 and 2.14); the census figures have been adjusted to reflect the number of jobs, rather than the number of employed persons, taking into account multiple job holders.

Table 3.12

Total Employment, with and without Coal Development, in the Impact Area and Seven-County Area 1970 and Projected 1980 and 1985

	1970	Projected 1980	Projected 1985
Impact area[a]			
With no coal development	1,620	1,620	1,620
With coal development			
Scenario IA	1,620	2,149	2,097
Scenario IB	1,620	1,884	1,858
Scenario IIA	1,620	2,311	3,986
Scenario IIB	1,620	1,966	2,802
Scenario IIIA	1,620	5,080	6,390
Scenario IIIB	1,620	3,350	4,004
Scenario IVA	1,620	2,636	2,906
Scenario IVB	1,620	2,128	2,262
Seven-county area[b]			
With no coal development	51,700	51,700	53,100
With coal development			
Scenario IA	51,700	52,650	53,957
Scenario IB	51,700	52,174	53,526
Scenario IIA	51,700	52,942	57,293
Scenario IIB	51,700	52,320	55,193
Scenario IIIA	51,700	57,780	61,553
Scenario IIIB	51,700	54,739	57,322
Scenario IVA	51,700	53,527	55,414
Scenario IVB	51,700	52,612	54,253

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970,* unpublished summary tape data (Helena, Montana), ST4P69-ST4P71, table 62; U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System, unpublished data (Washington, D.C., 1973); and idem, Regional Analysis Projections System, OBERS Projections, unpublished data (Washington, D.C., 1973). Derived. The projections under each scenario were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana).

Note: The 1970 employment figures presented here are not comparable with the 1970 census figures presented in tables 2.13 and 2.14; the census figures have been adjusted to reflect the number of jobs, rather than the number of employed persons, taking into account multiple job holders.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

The OBERS projections imply that, in the absence of coal-related development, total employment in the seven counties would have been 51,700 in 1980 showing no growth between 1970 and 1980. Between 1980 and 1985, a slight increase of 1,400 jobs is projected. OBERS projections are not available at the census county division level, so based on historical data, we project that total employment in the study area would have remained constant at 1,620 through 1980 and 1985.[7]

The effects of coal development on total employment in the economic impact areas very substantially among the various scenarios. In the seven-county area, coal-related and derivative employment in 1985 would comprise about 1 percent of the total under Scenario IB and range up to almost 14 percent under Scenario IIIA. The relative impact on total employment is much greater in the smaller impact area. In 1985, coal-related and derivative employment under Scenario IB is almost 20 percent of the projected total employment and increases to almost 75 percent with Scenario IIIA.

The projected population and net migration associated with each of the levels of employment are presented in table 3.13 and 3.14. The estimates of the population and net migration for each scenario and the "no coal development" level were calculated separately using the total employment values shown in table 3.12. We should remember that net inmigration is the excess of people moving into an area over the number moving out; it does not represent the total number of new people.

A projection of the future population under the "no coal development" assumption is not available for the study area, but we can make a comparison of the projected population for each scenario with the 1970

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[7] Ibid.

Table 3.13

Population and Net Migration in the Impact Area with and without Coal Development 1970 and Projected 1980 and 1985

	1970[a]	Projected 1980	Projected 1985
Population			
With no coal development	4,064	NA	NA
With coal development			
Scenario IA	4,064	5,170	5,160
Scenario IB	4,064	4,660	4,660
Scenario IIA	4,064	5,500	8,840
Scenario IIB	4,064	4,830	6,500
Scenario IIIA	4,064	10,900	13,780
Scenario IIIB	4,064	7,510	8,970
Scenario IVA	4,064	6,120	6,780
Scenario IVB	4,064	5,150	5,470

	1960-1970	Projected 1970-1980	Projected 1980-1985
Net migration[b]			
With no coal development	NA	NA	NA
With coal development			
Scenario IA	NA	510	-490
Scenario IB	NA	0	-410
Scenario IIA	NA	840	2,810
Scenario IIB	NA	170	1,240
Scenario IIIA	NA	6,200	1,610
Scenario IIIB	NA	2,850	640
Scenario IVA	NA	1,460	40
Scenario IVB	NA	480	-139

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), ST4P31-ST4P34, table 17, derived. The population and net migration projections were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana).

NA denotes that the data are not available.

Note: The impact area includes Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[a] This figure is an estimate based on the 20 percent census sample and differs slightly from the figure used in earlier text and tables. The estimate was used, in this case, because the projection procedure required a breakdown of the population by five-year age cohorts, and this breakdown was available only from the 20 percent sample summary tapes for census county divisions.

[b] A negative figure denotes net outmigration from the area.

Table 3.14

Population and Net Migration in the Seven-County Area with and without Coal Development 1970 and Projected 1980 and 1985

	1970	Projected 1980	Projected 1985
Population			
With no coal development	123,295	124,800	129,950
With coal development			
Scenario IA	123,295	126,730	131,770
Scenario IB	123,295	125,750	130,800
Scenario IIA	123,295	127,350	138,690
Scenario IIB	123,295	125,990	134,350
Scenario IIIA	123,295	137,340	147,930
Scenario IIIB	123,295	131,050	138,920
Scenario IVA	123,295	128,580	134,850
Scenario IVB	123,295	126,730	132,400

	1960-1970	Projected 1970-1980	Projected 1980-1985
Net migration[a]			
With no coal development	-8,182	-12,600	-2,750
With coal development			
Scenario IA	-8,182	-10,600	-3,170
Scenario IB	-8,182	-11,590	-3,020
Scenario IIA	-8,182	- 9,990	3,060
Scenario IIB	-8,182	-11,340	250
Scenario IIIA	-8,182	0	960
Scenario IIIB	-8,182	- 6,290	- 920
Scenario IVA	-8,182	- 8,750	-2,190
Scenario IVB	-8,182	-10,605	-2,530

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Analysis Projections System, OBERS Projections, unpublished data (Washington, D.C., 1973); and U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population and Housing: 1970, General Demographic Trends for Metropolitan Areas, 1960 to 1970, Montana,* PHC(2)-28 (Washington, D.C.: U.S. Government Printing Office, 1971), table 3, pp. 28-10 and 28-11. The population and net migration projections were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana).

Note: The seven-county area includes Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

[a] The negative figure denotes net outmigration from the area.

base. The smallest population increase is associated with Scenario IB which projects an increase of only about 600 people in both 1980 and 1985. The projection for Scenario IIIA is an increase of 6,836 people by 1980 and an additional increase of 2,880 between 1980 and 1985. The latter projection of 13,780 inhabitants in 1985 is associated, of course, with the most extensive development alternative considered and assumes that all the primary coal-related workers reside in the study area.

The net migration projections in table 3.13 indicate the sum of the expected inmigrants minus the expected outmigrants for the two time periods of each scenario. The fact that the number of net migrants is usually less than the corresponding increase in total population indicates that the natural increase in the population (excess of births over deaths) will account for much of the population gain.

The relative impact on the population of the seven-county area will be much less than for the study area (table 3.14). In fact, only the scenarios with projected gasification plants show substantial changes over the "no development" projections of population and net migration, particularly under the 50 percent residence assumption (the "B" scenarios). Only the extensive development under Scenario IIIA is enough to absorb the natural increase in the labor force and result in a projected zero net migration rate for 1970 to 1980. The migration rate for 1960 to 1970 was used for the first five years of the 1970 to 1980 period, assuming that extensive development would not start before 1976. By 1976, we project the seven-county area will have lost 6,165 people. After 1975, coal development will affect the migration rate and reduce the net outmigration.

The timing of the development has a large effect on the projected migration rates. For example, the reader may have noticed the apparently puzzling differences between the migration projections for Scenarios IIB and IIIB in table 3.14. In the 1970 to 1980 period, Scenario IIIB has a much lower net outmigration rate than Scenario IIB. In the 1980 to 1985 period the pattern reverses. Scenario IIB experiences net inmigration while IIIB continues to have net outmigration, even though the latter has over twice as many primary and derivative jobs sustained by coal development. The answer lies in the timing of the development.

In Scenario IIIB the two gasification plants are started in 1980, causing a sharp increase in population and a decrease in net outmigration; however, by 1985, the natural increase in the expanded population is much larger than the increase in coal mining can support, and so the seven-county area again experiences outmigration.

In the case of Scenario IIB the modest level of coal mining projected for 1980 causes a small reduction in net outmigration as compared to the "no development" alternative. However, when the gasification plant is included in the projection for 1985 net inmigration results because the natural increase in the local population is not great enough to supply the higher demand for employees.

Table 3.15 presents the projections of personal income (earnings plus property income and transfer payments minus social security contributions) in the economic impact areas.[8] With no coal development, OBERS projects personal income to rise from $442 million in 1970 to $625 million in 1980 and $741 million in 1985 in the seven counties. Each of the coal development scenarios shows an increase in personal income above the "no develop-

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[8] The OBERS definition of personal income differs slightly from that of the Bureau of the Census presented in Chapter I by including the value of goods and services in kind and computed value of owner-occupied homes as income.

Table 3.15

Total Personal Income, with and without Coal Development in the Impact Area and Seven-County Area 1970 and Projected 1980 and 1985

(In Thousands of 1970 Dollars)

	1970	Projected 1980	Projected 1985
Impact area[a]			
With no coal development	11,044	NA	NA
With coal development			
Scenario IA	11,044	22,361	24,911
Scenario IB	11,044	18,540	20,943
Scenario IIA	11,044	24,703	54,818
Scenario IIB	11,044	19,707	35,874
Scenario IIIA	11,044	62,109	93,235
Scenario IIIB	11,044	38,371	55,046
Scenario IVA	11,044	29,390	38,296
Scenario IVB	11,044	22,045	27,597
Seven-county area[b]			
With no coal development	441,527	624,665	741,048
With coal development			
Scenario IA	441,527	637,072	753,874
Scenario IB	441,527	630,839	747,400
Scenario IIA	441,527	640,894	802,669
Scenario IIB	441,527	632,744	771,765
Scenario IIIA	441,527	701,918	865,351
Scenario IIIB	441,527	663,254	803,050
Scenario IVA	441,527	648,542	775,719
Scenario IVB	441,527	636,559	758,265

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System, unpublished data (Washington, D.C., 1973) and idem, Regional Analysis Projection System, OBERS Projections unpublished data (Washington, D.C., November 1973). The projections under each scenario were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana).

NA denotes not available.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

ment" projection; the dramatic increases in Scenarios II and III again are a result of the introduction of gasification plants. For the study area, the total personal income projections follow the same pattern as for the seven-county area, varying from a low of $21 million in 1985 for Scenario IB to a high of $93 million under Scenario IIA. Of course, the impact of coal development in the study area relative to the 1970 base is much greater than for the seven-county area.

These income projections are more comprehensible when put on a per capita basis. Tables 3.16 and 3.17 present per capita personal income projections for the study area and the seven counties, respectively. In the study area the per capita income projections show a substantial growth under all of the scenarios. When expressed as a percentage of the nation as a whole, the projections indicate that the study area will make substantial gains in per capita income growth, particularly in Scenarios IIA and IIIA, involving gasification, where the projected figures for the United States will actually be exceeded.

Without coal development in the seven-county area, per capita personal income is projected to increase to $5,000 in 1980 and $5,700 in 1985 (table 3.17). Comparing these projections to the nation, we see that in the absence of coal development the economic well-being of residents will remain below that of the average American, showing only a small increase from 1970 to 1980 and remaining constant at 93 percent of the United States figure through 1985. Looking at the coal development alternatives we see only a slight improvement for the seven-county area in Scenarios II and III, where gasification is present, and in Scenario IVA under extensive export development.

Several important implications may be drawn from the per capita projections. First of all, income per person is positively related to the

Table 3.16

Per Capita Personal Income in the Impact Area
with and without Coal Development
1970 and Projected 1980 and 1985

	1970	Projected 1980	Projected 1985
Per capita personal income (in 1970 dollars)			
With no coal development	2,700	NA	NA
With coal development			
Scenario IA	2,700	4,300	4,800
Scenario IB	2,700	4,000	4,500
Scenario IIA	2,700	4,500	6,200
Scenario IIB	2,700	4,100	5,500
Scenario IIIA	2,700	5,700	6,800
Scenario IIIB	2,700	5,100	6,100
Scenario IVA	2,700	4,800	5,600
Scenario IVB	2,700	4,300	5,000
As a percentage of United States			
With no coal development	*68*	---	---
With coal development			
Scenario IA	*68*	*80*	*78*
Scenario IB	*68*	*74*	*73*
Scenario IIA	*68*	*83*	*101*
Scenario IIB	*68*	*76*	*89*
Scenario IIIA	*68*	*106*	*110*
Scenario IIIB	*68*	*94*	*99*
Scenario IVA	*68*	*89*	*91*
Scenario IVB	*68*	*80*	*81*

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System, unpublished data (Washington, D.C., 1973), and idem, Regional Analysis Projection System, OBERS Projections, unpublished data (Washington, D.C., November 1973). The projections under each scenario were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana). Percentages derived.

Note: The impact area includes Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

NA denotes not available.

Table 3.17

Per Capita Personal Income in the Seven-County Area with and without Coal Development 1970 and Projected 1980 and 1985

	1970	Projected 1980	Projected 1985
Per capita personal income (in 1970 dollars)			
With no coal development	3,600	5,000	5,700
With coal development			
Scenario IA	3,600	5,000	5,700
Scenario IB	3,600	5,000	5,700
Scenario IIA	3,600	5,000	5,800
Scenario IIB	3,600	5,000	5,700
Scenario IIIA	3,600	5,100	5,800
Scenario IIIB	3,600	5,000	5,800
Scenario IVA	3,600	5,000	5,800
Scenario IVB	3,600	5,000	5,700
As a percentage of United States			
With no coal development	*91*	*93*	*93*
With coal development			
Scenario IA	*91*	*93*	*93*
Scenario IB	*91*	*93*	*93*
Scenario IIA	*91*	*93*	*94*
Scenario IIB	*91*	*93*	*93*
Scenario IIIA	*91*	*94*	*94*
Scenario IIIB	*91*	*93*	*94*
Scenario IVA	*91*	*93*	*94*
Scenario IVB	*91*	*93*	*93*

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System, unpublished data (Washington, D.C., 1973), and idem, Regional Analysis Projection System, OBERS Projections, unpublished data (Washington, D.C., November 1973). The projections under each scenario were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana). Percentages derived.

Note: The seven-county area includes Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

level of coal development and, within the study area, is highly responsive to changes in the level of development. This is due, for the most part, to the addition of the higher-paying jobs in mining and gasification and to increased average earnings for workers in the derivative industries. Second, despite the significant increases associated with coal-related development, improvement in per capita incomes vis-a-vis the nation may not continue indefinitely. Looking at table 3.16 we see all the scenarios project that the study area's per capita income will increase faster than that for the nation as a whole from 1970 to 1980. However, Scenario I, which does not provide for an increase in the rate of coal development after 1980, projects a decline in per capita income from 1980 to 1985 relative to the national figure. This, and previous studies, indicate that unless the coal development continues to expand sufficiently over time, the impact may lead to a "one shot" increase in relative economic well-being for the area and may not be sufficient to provide continued improvement relative to the projected national average.

What can we say in summary concerning the role of coal-related development in the overall economy of the two economic impact areas? First of all--if we look only at employment--the impact will be significant. Assuming the highest level of development, Scenario IIIA, the new jobs created directly and indirectly will constitute 14 percent of the total for the seven-county area during 1985 and almost 75 percent of the total in the study area. Since both areas will be able to absorb much of the employment impact, the corresponding increases in population will be of a smaller magnitude. Although economic well-being, as measured by per capita income, will increase substantially in the study area as a result of coal development, the effect on per capita incomes in the seven-county area will be negligible. Also, unless the rate of coal development continues to increase, there is evidence that after the initial period incomes will continue to grow at a rate approximately equal to the national average.

Impact of Construction Activity

The economic impact of construction is transitory--the stimuli will disappear once the project is completed. Nevertheless, the changes caused by construction are significant and merit closer examination. In the previous sections we have sidestepped the economic impact of the construction of surface mines and gasification plants by assuming that no construction would be underway during the target years, 1980 and 1985. This may have been unrealistic but it allowed us to derive projections of employment, income, and population which are associated only with the extraction and utilization of coal and are not biased by the temporary influx of construction workers.

Projections which include the impact of construction activity would require numerous assumptions concerning the exact timing and methods used in the various projects. First, we would have to decide which facilities were under construction during 1980 and 1985. Then, because the number of workers varies over the life of the project, the precise stage of construction must be determined. Assumptions this precise, made five to ten years in advance, are extremely unreliable; even a short delay in starting construction could significantly change the actual impact during a given year. Rather than deriving projections which include construction, we have chosen to examine separately the profiles of construction activity for new surface mines and gasification plants.

Except for its duration, the economic impact of construciton is analogous to coal-related activity and, with a few modifications, may be projected in the same manner. That is, the earnings of construction workers may be considered as additional primary income which will be spent and respent in the local area, causing increased derivative employment and earnings. The major question is, how much derivative earnings will increase as a result of an additional dollar of construction earnings? Construction workers are notoriously mobile, moving from one site to another while maintaining a home and family elsewhere. Others may bring their families with them but will not remain long enough to become part of the local community. Finally, local residents hired for a brief period may view their earnings as windfall gains, not spending them in the same manner as their usual income. All of these reasons suggest that, dollar for dollar, construction earnings will have a smaller impact on the derivative sector than equivalent (permanent) increases in primary sectors. We have some evidence that this has been true for other major construction projects in Montana. This is also confirmed by the findings of studies for other areas.[9] Thus we will assume that change in derivative earnings resulting from a change in construction earnings will be one-half that used for other coal-related projects.[10] That is, $1.00 of construction earnings will increase derivative earnings by $.70 in the seven counties and $.25 in the three counties, one-half the values in table 3.3, which were used to compute the projections in tables 3.4 to 3.11.

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[9] Martin J. Wistisen and Glen T. Nelson, *Kaiparowits Socio-Economic Study* (Provo, Utah: Brigham Young University, Center for Business and Economic Research, 1973), p. 170.

[10] This is only a guess. We are quite certain the impact of construction is smaller, but we don't know how much smaller.

Secondly, we will assume that a new job, whether in construction or derivative industries, will be associated with two people living in the area. This is equivalent to an aggregate participation ratio of 0.50, compared to 0.43-0.45 implied by the projections for mining activities in tables 3.12 through 3.14. The number of persons directly and indirectly associated with construction activity depends critically on the precise composition of the construction work force and the degree to which they live in the four-division impact area. All things considered, we think a participation rate of 0.50 is, if anything, too low and the resulting population estimates too high; but, in lieu of reliable contradictory evidence, we prefer to be on the safe side. It should be remembered that we are creating a rather artificial distinction between the periods of construction and operation. This is especially true in the case of the derivative jobs created by construction activity. Although the initial stimuli will disappear once construction has ceased, these positions may continue to exist and be supported by the spending and respending of the permanent employees. Thus, the population may decrease only to the extent that it consists of construction workers and their families.

Construction profiles for a representative surface mine and gasification plant are presented in tables 3.18 and 3.19. They were calculated using (real) wage rates and other relationships as projected to exist in 1980. This may appear contradictory because we assumed no construction activity during 1980 and 1985, but we felt that a more accurate picture could be presented using future rather than current values. In addition, some of the projects extend over several years, and some values and relationships may change during the course of construction. Consequently, these projections should be interpreted as simply rough approximations of the impact of construction activity occurring sometime during the 1976-1985 period. This also implies that they are not strictly comparable to the projections presented in tables 3.3 to 3.14. It also should be noted that one cannot add the impact of construction to that of operation to derive the "total impact"; such a procedure suggests that facilities would be simultaneously under construction and in full operation.

The construction profile of a 10-million-ton-per-year surface mine is presented in table 3.18. These estimates were derived from unpublished data provided by the Northern Great Plains Resources Program and the U.S. Bureau of Mines and should be interpreted with caution because, to our knowledge, no 10-million-ton mine has yet been started from scratch; also the profile would be quite different if, instead of building for ten million tons at the start, the mine would begin at a lower capacity and expand as needed. Nevertheless, these sources provide the only current data for this type of project.

Table 3.18 reports that the construction of a 10-million-ton-per-year surface mine would require two years and employ 150 workers, earning $2,250,000, during the first year, and 250 workers, with earnings of $3,750,000, during the second. A significant portion of the construction jobs will be associated with the erection of the dragline and unit train loading equipment. Many of the people on these jobs may be highly trained and skilled personnel employed directly by the manufacturer. We project that during the first year there will be an additional 78 derivative jobs, with earnings of $562,500, in the study area and 197 additional derivative jobs, with earnings of $1,575,000, in the seven counties.[11]

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[11] Once again, the numerical precision of these projections should not be taken too seriously. They are carried to the last worker and hundreds of dollars simply to facilitate computation.

Table 3.18

Construction Profile for a 10-Million Tons per Year Coal Surface Mine in the Impact Area and Seven-County Area

	Year 1		Year 2	
	Employment (Annual Average)	Earnings (In 1970 Dollars)	Employment (Annual Average)	Earnings (In 1970 Dollars)
Impact area[a]				
Primary industries (construction)	150	2,250,000	250	3,750,000
Derivative industries	78	562,500	130	937,500
All industries, total	228	2,812,500	380	4,687,500
Population	450		750	
Seven-county area[b]				
Primary industries (construction)	150	2,250,000	250	3,750,000
Derivative industries	197	1,575,000	328	2,625,000
All industries, total	347	3,825,000	578	6,375,000
Population	700		1,150	

Note: This profile was developed using (real) wage rates and other relationships projected to exist in 1980.

[a] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[b] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

During the second year derivative employment will rise to 130 in the impact area and 328 in the seven counties, with associated earnings of $937,500 and $2,625,000 respectively. In total, we project that the study area will experience increases of 228 and 380 job opportunities during the two years of construction. The corresponding estimates for the seven counties are 347 and 578 jobs, respectively. The number of persons associated with construction during the first year is 450 in the study area and 700 in the seven counties. During the second year, these will rise to 750 and 1,150, respectively.

The construction profile of a representative gasification plant is shown in table 3.19. These data were also gleaned from material supplied by Northern Great Plains Resources Program and from unpublished reports concerning proposed gasification plants in North Dakota and Wyoming. As with all information concerning gasification, it must be interpreted cautiously because there are no plants of this size yet in operation.

We saw earlier that in terms of employment and earnings, gasification plants dwarf other coal-related activities. The same holds true during the construction phase. During the first year, employment will average 840 workers. It will skyrocket to 2,190 for the second year and then decline slightly to 2,040 during the third year. Finally, it will trail off to an annual average of 315 workers (representing six months of actual working time) during the fourth year of construction. At its peak during the second year, construction workers will earn $32,850,000 per year. In terms of total employment (construction plus derivative), the seven counties will experience 1,943 additional job opportunities during the first year, 5,064 during the second, 4,718 during the third, and 728 during the fourth. The number of persons for the four years are 3,900; 10,100;

Table 3.19

Construction Profile for a 250-Million SCFD Gasification Plant in the Impact Area and Seven-County Area

	Year 1		Year 2		Year 3		Year 4[a]	
	Employment (Annual Average)	Earnings (In 1970 Dollars)	Employment (Annual Average)	Earnings (In 1970 Dollars)	Employment (Annual Average)	Earnings (In 1970 Dollars)	Employment (Annual Average)	Earnings (In 1970 Dollars)
Impact area[b]								
Primary industries (construction)	840	12,600,000	2,190	32,850,000	2,040	30,600,000	315	4,725,000
Derivative industries	438	3,150,000	1,141	8,212,500	1,063	7,650,000	164	1,181,250
All industries, total	1,278	15,750,000	3,331	41,062,500	3,103	38,250,000	479	5,906,250
Population	2,550		6,650		6,200		950	
Seven-county area[c]								
Primary industries (construction)	840	12,600,000	2,190	32,850,000	2,040	30,600,000	315	4,725,000
Derivative industries	1,103	8,820,000	2,874	22,995,000	2,678	21,420,000	413	3,307,500
All industries, total	1,943	21,420,000	5,064	55,845,000	4,718	52,020,000	728	8,032,500
Population	3,900		10,100		9,450		1,450	

Notes: This profile excludes construction of an associated coal mine and was developed using (real) wage rates and other relationships projected to exist in 1980.

SCFD denotes standard cubic feet per day.

[a] Six months actual working time.

[b] Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

[c] Big Horn, Powder River, Rosebud, Custer, Musselshell, Treasure, and Yellowstone counties.

9,450; and 1,450. In the study area, total employment will be 1,278 during the first year; 3,331 during the second; 3,103 during the third; and 479 during year four. The population associated with this employment will number 2,550; 6,650; 6,200; and 950 for the three and a half years of construction. Increased employment and population of these magnitudes in so small an area are mind-numbing. However, we should remember that the prospects for gasification are, at best, uncertain. Also, these projections may overestimate the actual number of persons associated with construction.

Outlook for Industries and Community Institutions in Light of Potential Coal-Related Development

Having developed projections of the overall population, income, and employment for the impact area, given the alternative levels of coal development, we will now turn our attention to the existing industries and institutions in the area and the effects coal development may have on them. At this point, however, we cannot do much more than speculate, because the location, timing, type, and level of coal development will have differing effects on each segment of the economy. But, based on what we currently know about these industries and about coal development, we can make some general comments.

Agriculture

As we saw earlier, agriculture is the economic backbone of the study area and, in terms of land use, the only major alternative to coal development. There are two ways in which coal development, especially surface mining, will affect agriculture. First of all, strip mining will, at least temporarily, remove some agricultural land from production. Second, the productivity of adjacent land may be affected due to a reduced supply of groundwater or because of pollution from gasification plants. Both of these potential impacts will have a detrimental effect on gross farm receipts and the earnings of local farmers and ranchers. This, in turn, will have a negative impact on the local economy as we have discussed earlier.

The most crucial determinant of the actual effect on local agriculture is the ability of the coal companies to return the land to a productive level after surface mining. There are various claims and counterclaims about their ability to do so, but the evidence we have seen so far is inconclusive. For our projections, we assumed the worst: that none of the disturbed land will be put back into production. By 1985, we project the cumulative acreage disturbed by surface mining will be 2,844 acres under Scenario I and range as high as 6,956 acres under Scenario III (tables 3.4 - 3.11). These figures are based on the average thickness of the coal seams in the area, which determines the number of tons beneath an acre of land and may vary depending on which sites are mined. Also, we have not explicitly considered the farm land removed from production due to new roads, railroad rights-of-way, coal conversion sites, or town sites. However, we believe the total for these uses will be small relative to the number of acres disturbed by surface mining. To put things in perspective, the average ranch in the three-county area was about 5,800 acres in size during 1969. Thus, disturbing as much as 6,956 acres (projected by 1985 under Scenario III) corresponds to the elimination of little more than an average ranch. This is, of course, an oversimplification because the mined land will be spread over a large area and will include parts of several ranches.

The type of land which will be mined (rangeland or irrigated cropland) will have a profound effect on agriculture. If the surface mining takes place on rangeland, the loss to agriculture in the study area would be relatively small. Using the projection of 6,956 acres removed from agricultural use (by 1985 under Scenario III) and the average grazing capacity of the area's rangeland, grazing capability would be cut by about 400 head of cattle. However, if all the land disturbed is irrigated cropland, the study area's agricultural base could be seriously affected, since (under Scenario III) about a third of the irrigated acreage would be taken out of production. As we mentioned earlier, the 20,700 irrigated acres in the study area are devoted largely to producing hay for winter forage, essential to the ranchers' year-round operations. How many ranch operations would be affected, we don't know. There are, however, additional areas in the study area which could be irrigated to make up for the loss in winter forage supply, although the cost of that forage would no doubt be higher. The Department of Natural Resources and Conservation has classified about 187,000 acres of land in the study area as irrigable land; that is, land with topography and soils suitable for irrigation without considering the economic costs or availability of water.[12]

For our projections we have assumed that surface mining will disturb both types of agricultural land and that the average value of production of the mined land is $30 per acre (in 1970 dollars) to avoid underestimating the impact on agriculture. This compares to actual gross farm receipts from the sale of crops and livestock of about $6 to $7 per acre in 1970 for all agricultural land in the three counties.

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[12] Montana Department of Natural Resources and Conservation, Water Resources Division, unpublished data (Helena, Montana, May 1975).

The second major impact on agriculture is the effect of coal mining on the productivity of adjacent acreage. The mining of coal may lower the water table and reduce the flow in nearby stock and irrigation wells. Current data are very sketchy, but it appears that wells within one-quarter mile or so of the mine will be affected and those directly downhill from the mine cut may completely dry up.

We may have painted too dark a picture for the future of agriculture in the area. The reader should keep in mind we have assumed that the land disturbed by mining will not be reclaimed, and our upper estimate of land removed from agricultural use by 1985 (6,956 acres) is based on Scenario III which projects seven surface mines and two gasification plants in operation by 1985--the highest level of development projected. In general, we feel that agriculture will be able to coexist with surface mining operations in the area although there will be definite disruptions near the locality of the mine. Probably, the biggest effect on agriculture will be the change in the ranchers' ways of life, due to more people living and working in the area, rather than changes in their ranching operations or profitability.

1,000,000 acres ?

Mining

The outlook for the mining industry is, of course, directly tied to the future of coal development in the study area. What that future is, no one knows. The future demand for energy, technological advances, development of alterntives to fossil fuels as energy sources, national energy policies, and the political environments in Montana and the nation will all affect coal development in the state.

Two factors may have profound effects on the rate of development of Montana's coal resource: First, improvements may be made in the efficiency of sulfur scrubbers for electrical generating plants. Much of the current demand for Montana coal for export is due to the midwestern utilities' attempts to comply with sulfur emission standards. If present research is successful, sulfur scrubbers may become efficient enough to enable these companies to rely on closer and cheaper sources of coal. This would significantly decrease the demand for Montana coal. Second, the 1975 Montana State Legislature made a major revision in the Strip Coal Mines License Tax, setting the rate at 20 percent of value for lignite coal under 7,000 Btu's per pound and 30 percent for all other strip-mined coal. These changes make Montana's taxes on coal extraction the highest in the nation.[13] The effect of this increase may not be felt for some time, however. Most coal production contracts allow the producer to pass increases in coal taxes through to the purchaser of the coal, so current profitability may not be affected. Future coal development decisions will do doubt be affected by the tax increase, but a lot will depend upon the adjustment neighboring coal-producing states make in their coal tax structures. We would expect them to raise their tax rates on coal extraction but not as high as Montana. The size of the differential in tax rates between Montana and neighboring states will definitely affect the long-run demand for Montana's and, hence, the study area's coal.

Wood Products

The wood products industry should be relatively unaffected by coal development in the study area. For the most part, the strippable coal beds are not located below the forested areas. The heavily timbered areas are generally found on slopes too steep for strip mining. The two areas with substantial forested land probably will not be mined, at least in the near future. The Ashland Division of the Custer National Forest will not be strip mined for coal unless authorized by congressional action. The likelihood of this action is open to much speculation. The Northern Cheyenne Tribe, which owns the other major forested area, is apparently not eager to develop its coal resource but, rather, prefers to wait and evaluate effects of development on the Crow Reservation and other areas.

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[13] Montana State Legislature, Environmental Quality Council, *Montana Energy Policy Study*, Final Report, revised edition (Helena, Montana, 1975), p. 195.

Development on private land may result in the removal of some commercial timber stands, but probably not a significant amount. Any timber in the mining area would be clear cut (all vegetation removed) and sold prior to the mining operation, so the short-run supply of sawtimber will not be reduced. Reforestation of the mined areas, if successful, would minimize the effect on the long-run supply. The local demand for wood products for residential and commercial construction will probably increase as a result of any influx of new residents into the study area. The lumber mill at Ashland has indicated it would respond to this demand by expanding its retail facilities at the mill.[14] Any further expansion of the wood products industry in the study area appears unlikely because of the relatively limited annual supply of sawtimber available.

Outdoor Recreation

The lifestyles of the residents of the impact area are largely oriented to the out-of-doors. Many residents are involved in agricultural activities. Therefore, except for hunting and fishing, there is little reason for them to leave their own land (or immediate locality) in pursuit of outdoor recreation.

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[14] Statements by Al Carpenter, Eastmont Forest Products, Inc., personal and telephone interviews, Ashland, Montana, April and June 1975.

We expect a different pattern will emerge among new residents attracted to the study area because of coal-related development. By and large, the coal-related workers will have indoor jobs as clerical workers or work in a relatively restricted area, such as a mine or gasification plant. They will have relatively high incomes, be quite mobile, and, at least initially, are likely to investigate the recreational facilities around them. Their interest in the outdoors may diminish as time passes, but it appears certain that as the population of the area increases the demand for outdoor recreation will also increase.

As we mentioned earlier, the developed recreational facilities in the area are few in number and access to recreation sites is a problem in some areas. Boundaries between public and private land often are unclear and incidents of disregard for private property no doubt will increase. Damage to the environment from such things as litter and off-the-road vehicle use probably will increase. Coal development facilities will disrupt some animal ranges and may affect the supply of game in the area.

The opportunities for tourist facilities in the area will increase as more people become familiar with the study area. However, the lack of a single outstanding attraction does limit the potential. Facilities catering to hunters could be developed since that activity apparently has a large drawing power, but the season is quite short, making such ventures quite risky.

Water Resources and Uses

Coal-related development may affect water use in two ways: 1) surface mining of coal may impair the quantity or quality of groundwater in wells and springs adjacent to the mine; and 2) gasification plants will consume significant quantities of water, which would be in addition to the extensive current use of water by agriculture.

There are very little current data concerning the impact of surface mining on the availability of groundwater. In the one area for which there are data, wells within one and one-half miles of the mine have experienced some drops in water level. But only those immediately adjacent (less than one-quarter mile) to the mine may become nonproductive. After mining has ceased, there is some evidence that groundwater levels may increase, but water quality may be impaired by its seeping through the spoilbanks.[15]

We expect gasification plants in Montana will consume about 10,000 acre-feet of water per plant per year. Scenario III projects two gasification plants in 1980 and 1985 which would require a total of 20,000 acre-feet of water per year. Only the Tongue River Reservoir and the Yellowstone River currently have a sufficient year-round supply of water to support two such plants. The distance from the Yellowstone River to the Decker-Birney-Ashland area would make the transfer of water from that source rather expensive. The Tongue River Reservoir, while close to potential coal conversion sites in the study area, is largely committed to agricultural use. Only about 4,000 of the 40,000 acre-feet of water are allocated to industrial use. Therefore, it appears that before gasification plants can be operated in the study area, additional storage reservoirs or aqueduct systems will have to be built.

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[15] Wayne A. Van Voust, "Hydrologic Effects of Strip Coal Mining in Southeastern Montana--Emphasis: One Year of Mining near Decker," mimeographed (Butte, Montana: Montana College of Mineral Science and Technology, Montana Bureau of Mines and Geology, 1974), p. 10.

eliminating bottomlands

Two reservoir projects have been proposed for the study area which could result in an additional 117,000 acre-feet of water: 1) expansion of the Moorhead Reservoir which would straddle the Montana-Wyoming border on the Powder River and increase its capacity by 57,000 acre-feet per year; and 2) similar expansion of the Tongue River Reservoir to add an additional 60,000 acre-feet of annual water supply.

It has been suggested that increases in the supply of water be used in agriculture rather than for the processing of coal. We have seen that there is a significant potential for the expansion of irrigated acreage. However, we are unable to assess whether or not irrigating this land is economically feasible. The costs are probably quite high and may be the principle reason this land is not currently under irrigation.

In summary, we believe that coal-related development at the projected levels need not be hindered by the availability of water. There appear to be sufficient quantities of water to satisfy these needs, providing that the required reservoirs or aqueducts are built, without endangering the existing supplies to agriculture and other water uses. The eventual distribution of water in the area will probably be settled in the courts, as several water rights litigations and requests for water reservation are currently pending.

Community Institutions and Public Services

A detailed analysis of the impacts of coal development on community institutions and the demand for public services is beyond the scope of of this report. Several studies of the effects of development on on community institutions in the study area and adjacent coal mining areas have been conducted or are underway.[16] These studies are also concerned with assessing the current attitudes of local residents and their possible reactions to coal development. Concentrated research into the relationship between growth created by coal development and public services and local government finance in sparsely settled areas is currently being performed by the University of Montana's Bureau of Business and Economic Research. The results of this research should be available in July 1976.

We are safe in assuming that the demand for public services will increase as more people move into the study area. But we speculate that the demand will be primarily for the basic governmental services, such as road improvements and added police protection. Most newcomers to the area will be cognizant of the rural nature of the area and be prepared to travel to one of the surrounding cities for shopping and specialty services. Also the newcomers probably will be quite mobile, particularly those in construction jobs, and may not look at the study area as a permanent home requiring a full range of governmental services and facilities. The current residents apparently like the status quo and will probably only want increased governmental services in areas such as police protection to insulate themselves from the newcomers.

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[16] For example, see: U.S. Department of the Interior, Bureau of Reclamation, and Montana State University, Institute of Applied Research, *Anticipated Effects of Major Coal Development on Public Services, Costs and Revenues in Six Selected Counties*, prepared for the Northern Great Plains Resources Program (Bozeman, Montana, 1975); Patrick C. Jobes and Milton G. Parsons, *Satisfaction, Coal Development and Land Use Planning: A Report of Attitudes Held by Residents of the Decker-Birney Study Area*, prepared for the Montana Energy Advisory Council (n.p., April 1975); and University of Montana, Community Service Program, "A Study of Social Impact of Coal Development in the Decker-Birney-Ashland Area," mimeographed, prepared for the Montana Energy Advisory Council (Missoula, Montana, May 1975).

The biggest effects of coal-related development on the public sector of the study area will be the rapid growth of small towns and overcrowding of the local public schools. A rapid influx of new people into any small town of the study area would probably lead to chaotic growth. None of the present towns are incorporated or have any type or governing body, formal or informal, which could guide or regulate the growth of the local area. The result is likely to be a patchwork of trailer-court complexes, traffic congestion, inadequate water and sewage systems, and overcrowded schools--the stereotype of an industrial boom town. Certainly, if this happens to a town, the demand for growth planning will emerge but probably much too late to help the town.

Of course the impact of a development project depends upon its size, location, and the timing of its construction. The location of the project relative to the town or towns where its employees choose to reside is also a very important factor. If the project and the residential community are located in different taxing units, (counties and/or school districts), tax revenue generated by the coal development project may not be available to the county and the school districts feeling the impact of the increased population. Clearly some form of area-wide plannning is needed to alleviate these kinds of developmental problems. County planning boards, while a move in the right direction, can still be faced with the disproportionate impacts of intercounty developments. Legislation passed by the 1975 Montana legislature which will channel about 30 percent of the Strip Coal Mines License Tax back to impacted local counties and communities should help this problem.[17]

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[17] Montana State Legislature, p. 195.

Table 3.20

Age-Sex Distribution of the Population in the Impact Area under Alternative Levels of Coal Development 1970 and Projected 1980 and 1985

		0-4 Years	5-9 Years	10-14 Years	15-19 Years	20-24 Years	25-29 Years	30-34 Years	35-39 Years	40-44 Years	45-49 Years	50-54 Years	55-59 Years	60-64 Years	65-69 Years	70-74 Years	75-79 Years	80-84 Years	85 Years and Over	Total
1970 population																				
	Male	247	244	245	170	165	128	137	105	106	98	152	86	57	55	19	11	8	5	2,038
	Female	263	292	215	226	132	148	97	92	95	109	103	82	59	39	39	17	12	6	2,026
Projected 1980 and 1985 populations																				
Scenario IA																				
1980:	Male	266	220	260	275	328	212	184	138	145	107	106	90	131	69	42	34	9	5	2,620
	Female	247	205	282	313	280	234	153	153	101	97	96	108	99	76	51	30	23	8	2,554
1985:	Male	314	247	205	233	210	276	181	165	122	134	96	96	80	111	54	28	20	5	2,577
	Female	295	231	187	262	263	257	212	140	145	93	90	88	99	88	64	39	20	14	2,587
Scenario IB																				
1980:	Male	245	202	244	248	261	160	153	120	132	98	99	86	128	67	40	32	8	4	2,328
	Female	229	189	263	292	229	211	131	142	94	90	91	103	95	72	48	28	22	8	2,334
1985:	Male	274	230	190	222	193	218	135	137	107	122	88	89	76	109	52	27	19	4	2,294
	Female	257	216	174	246	250	210	193	120	134	86	84	84	95	85	61	37	18	13	2,365
Scenario IIA																				
1980:	Male	279	232	270	293	370	244	203	149	154	113	111	93	132	70	43	36	10	5	2,807
	Female	258	214	294	326	313	249	167	161	106	101	99	110	101	78	53	32	24	9	2,695
1985:	Male	475	376	315	417	656	648	411	299	223	198	150	127	99	126	68	43	28	8	4,667
	Female	437	342	315	405	606	438	369	230	202	144	127	121	128	114	86	57	31	18	4,169
Scenario IIB																				
1980:	Male	252	208	249	257	283	177	163	126	136	101	101	88	129	67	40	33	9	4	2,422
	Female	234	194	269	299	245	219	138	145	96	92	92	104	96	73	49	29	22	8	2,405
1985:	Male	354	294	245	314	417	405	250	204	157	154	116	105	86	117	60	34	23	6	3,340
	Female	328	271	239	318	422	300	271	165	163	112	102	101	110	98	72	46	24	15	3,157

Scenario IIIA																				
1980:	Male	493	419	430	577	1,068	781	525	337	299	204	192	136	159	92	64	57	21	10	5,864
	Female	446	375	487	540	849	490	397	284	187	176	153	159	144	115	85	59	40	14	5,001
1985:	Male	888	548	467	514	782	1,220	871	576	375	319	220	193	132	144	81	54	38	14	7,436
	Female	827	493	433	550	700	919	558	432	306	207	189	162	164	145	112	78	46	27	6,346
Scenario IIIB																				
1980:	Male	359	302	330	399	631	445	324	219	208	147	141	109	142	78	51	44	14	7	3,950
	Female	328	275	366	406	513	339	253	207	136	129	119	129	117	92	65	42	30	11	3,558
1985:	Male	560	380	320	362	479	690	480	343	233	214	151	138	102	126	66	40	28	9	4,723
	Female	523	346	297	391	469	540	365	266	215	143	133	121	128	113	85	56	31	20	4,244
Scenario IVA																				
1980:	Male	304	253	288	326	451	307	241	171	171	123	121	98	135	73	45	38	11	6	3,162
	Female	280	233	316	351	375	277	193	175	116	110	105	116	106	82	57	35	26	9	2,963
1985:	Male	417	304	254	289	328	452	306	240	169	168	119	114	89	118	59	33	24	7	3,489
	Female	390	280	234	317	353	376	278	193	174	114	108	102	111	99	73	46	25	16	3,291
Scenario IVB																				
1980:	Male	264	219	259	273	323	208	181	136	144	106	106	90	130	69	41	34	9	5	2,599
	Female	245	204	280	311	276	233	151	152	101	96	95	107	98	75	51	30	23	8	2,539
1985:	Male	326	258	214	250	254	307	198	175	131	139	100	98	81	113	55	30	21	5	2,754
	Female	305	240	198	274	296	269	226	147	149	97	93	91	101	90	66	41	21	14	2,720

Sources: Montana Department of Intergovernmental Relations, Research and Information Systems Division, *U.S. Census of Population: 1970*, unpublished summary tape data (Helena, Montana), STIP31-STIP34, table 17; 1970 population figures for ages seventy-five and over, by age cohort, were derived. The projections were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana).

Notes: The impact area includes the Busby-Decker, Ashland-Lame Deer-Birney, Stacey, and Otter census county divisions.

The age detail may not add to the total because of rounding.

The development of new communities, sponsored by the coal development companies, has been suggested as a means of controlling community growth and still providing needed housing and municipal services to the new residents of the area. The advantages would be: 1) the housing community could be located near the project site, reducing commuting costs; 2) company ownership could serve to regulate growth and construction quality in the community; and 3) the companies could provide capital for public service construction (schools, water and sewer systems, streets, etc.) prior to the influx of population in the community. While there are well-known disadvantages such as . . . to living in a "company town", and companies surely are not anxious to get into the "town business", we feel this mechanism for supplying housing and municipal services to employees of coal development projects warrants further investigation.

We are able to provide an age-sex breakdown of the study area population, for each of the eight scenarios, for 1970 and projected 1980 and 1985. Table 3.20 presents the population data for each scenario by five-year age cohorts. These data can be of use in future studies concerned with public services and community institutions. However, it should be remembered that these projections do not include the transitory impacts of the construction period.

Outlook for the Ashland Division of the Custer National Forest in Light of Potential Coal-Related Development

The expected effects of coal-related development in the study area on the Ashland Division vary slightly depending upon whether or not it is assumed strip mining will take place on the National Forest. At this point, the probability of strip mining on the Ashland Division is uncertain. The general position of the federal government seems to be to ban strip mining on National Forests but the Ashland Division has been suggested by some people as a possible, single exception to a ban. Therefore, we will consider both alternatives as we discuss the potential effects of coal development on the timber, grazing, and recreation resources of the Ashland Division.

Timber

The outlook for the timber resource of the Ashland Division should be relatively unaffected by mining on or off the National Forest. As we have mentioned, the heaviest timber stands are generally located on slopes too steep for surface coal mining. Where overlaps of timber and strippable coal do occur, the timber would be cut and utilized prior to mining. Removal of this land from timber production could have an effect on the long-run supply of sawtimber, but we do not feel it would be significant relative to the total timber resource of the Division.

Coal-related development may increase the demand for lumber products in the study area for construction purposes. However, it is doubtful this would result in much increase in demand for sawtimber. With more people in the area the demand for lumber remodeling and business construction projects will be greater. But, we expect very little wood will actually be used in coal-related construction, and most residential complexes will probably utilize modular home or mobile homes constructed outside the study area.

Grazing

As we have seen earlier, the success of grazing operations in the study area is closely related to using the relatively small amount of irrigated land to produce hay crops for winter cattle forage. Therefore, the effect of coal development on cattle grazing operations depends largely on which type of land is disturbed in the mining process.

If we assume there will be no strip mining within the National Forest boundaries, but rather on the agricultural land of grazing permittees surrounding the Ashland Division, we would expect the demand for grazing allotments to diminish. It appears that irrigated land, located generally on the flat bottoms of the valleys, is also the easiest land to strip mine; so, we feel safe in assuming that if mining occurs on a ranch, the irrigated acreage will be disturbed, effectively removing the unit from cattle production.

If grazing permittees located around the Division curtail their operations to allow mining on their land (either as a result of selling or leasing to the coal companies), their need for grazing allotments on the Division will presumably be reduced accordingly. This will give the Forest Service the option of reallocating the unused allotments among the remaining permittees, granting new permits to other ranchers further away from the Division, or reducing the total grazing allotment of the Division.

However, if the adjacent mining operations are only on land currently used for grazing (for example, land held by the Bureau of Land Management or the state of Montana) those grazing permittees affected might turn to the Forest Service to make up the allotments they lose on the mined land. The amount of land held by the Bureau of Land Management and the state close to the Division does not appear great enough to make this a serious problem for the Forest Service.

If mining is permitted within the National Forest boundaries the impact on grazing will be greater but still not very significant when compared to the total grazing resource of the Division. Again, the impact depends largely on what type of land is mined. The small ranches on privately owned land within the Division are located primarily along the creek drainages which supply water for irrigated hay. If these areas are mined, some ranch units probably will be removed from production, lowering the demand for federal grazing allotments as we saw above. However, if federally owned grazing land is mined instead, the supply of grazing land will be reduced and this probably will require an adjustment of the total grazing allotments granted for the Division--but, we think the adjustment will be a small one. If all the mining projected in Scenario III was conducted on the Ashland Division, approximately 7,000 acres would be disturbed by 1985 for surface mining operations. Using an average requirement of 18 acres of grazing land per animal per year, and assuming the optional grazing capacity is about 120,000 AUMs per year, the total capacity of the Division would be cut by less than 3 percent.

In summary, the aggregate potential impact on the grazing resource of the Division from surface coal mining on or off the forest does not appear to be very great. Of course, the impact on individual ranchers may be substantial. For example, the mining of coal may lower the water table and reduce the flow in nearby stock and irrigation wells, thus affecting the productivity of neighboring ranch units.

Recreation

Data on recreational use of the Ashland Division are very sketchy. We know very little about the usage trend over time and we are not able to separate the current usage data into resident and nonresident use. Also, new residents of the area will view outdoor recreation differently than the current residents--but how differently we don't know. Therefore, we have made some simplifying assumptions about recreational use of the Ashland Division to allow us to project usage, given the eight coal-development scenarios. First, recreational use of the Division is proportional to the population of the study area. This infers that use by nonresidents of the area will also increase in proportion to the study area population. Second, the recreational habits of the new residents will be the same as the current residents and will not change over time. Therefore, based on Forest Service estimates of dispersed and developed recreation in 1970 we project the following usage for 1980 and 1985.[18]

Dispersed Recreation Use
(Visitor Days)

	Estimated 1970	Projected 1980	Projected 1985
Scenario IA	10,800	13,700	13,700
Scenario IB	10,800	12,400	12,400
Scenario IIA	10,800	14,600	23,500
Scenario IIB	10,800	12,800	17,300
Scenario IIIA	10,800	29,000	36,600
Scenario IIIB	10,800	20,000	23,800
Scenario IVA	10,800	16,300	18,000
Scenario IVB	10,800	13,700	14,500

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[18] U.S. Department of Agriculture, Forest Service, Custer National Forest, unpublished data (Billings, Montana, May and June 1975). The projections were developed by the University of Montana, Bureau of Business and Economic Research (Missoula, Montana).

Developed Recreation Use
(Visitor Days)

	Estimated 1970	Projected 1980	Projected 1985
Scenario IA	12,400	15,800	15,700
Scenario IB	12,400	14,200	14,200
Scenario IIA	12,400	16,800	27,000
Scenario IIB	12,400	14,700	19,800
Scenario IIIA	12,400	33,300	42,000
Scenario IIIB	12,400	22,900	27,400
Scenario IVA	12,400	18,700	20,700
Scenario IVB	12,400	15,700	16,700

These projections are very rough guesses because of the limited data and our simplifying assumptions, but they do point out that the demand for outdoor recreation on the Ashland Division will increase substantially as the population increases. The Forest Service estimates that the current developed recreation sites (10 acres of campgrounds) have a theoretical capacity of 21,000 recreation visitor days. But since almost all of the campground use is in the summer and fall, the effective capacity is much lower. The projections for developed recreation indicate that several more acres of campgrounds would be required to meet the projected usage for several of the scenarios.

Coal mining on the Ashland Division will, no doubt, have an adverse affect on the scenic attractiveness of the Division, at least in the area of the mining operations, and may concentrate the recreational usage in nonmining area. Game ranges would probably be disturbed and this would affect the hunting on the Division--the major attraction of the Forest. On the other hand, it might be feasible to create a man-made lake as a part of the reclamation program--a feature which would make the Division more attractive to many people in the area.

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IV

COAL DEVELOPMENT IN THE DECKER-BIRNEY-ASHLAND AREA: AN OVERVIEW

The previous chapters have presented our analysis of the economic structure of the Decker-Birney-Ashland area and projections of the economic impacts of several alternative levels of coal-related development. Given the limited amount of data available for such a small economic area, we tried to be as detailed as we could yet still give the reader a feeling of how the economic variables fit together and how they would be affected by coal development. We may have gotten lost, though, in the maze of tables, assumptions, and footnotes. Therefore this section will take a step back, quickly review some of the major findings, and attempt to fit the components together for one last look.

In Chapter II we saw that the Decker-Birney-Ashland area is a sparsely populated rural section of southeastern Montana. There are a large number of Indians in the area, primarily centered on the Northern Cheyenne Indian Reservation. The population trend has been upward and is attributable to an increase in the Indian population.

Incomes of the residents are generally low. Poverty is more widespread in the study area than in the seven counties or the state--at least partly because of the large proportion of Indians.

Almost a third of the area's employment is in agriculture. Manufacturing is also important because of two sawmills and a plastics factory. Relatively few people are engaged in wholesale or retail trade, finance, or services. Unemployment is high among Indians--estimates run to 25 to 30 percent, if those who have ceased searching for employment are included.

Agriculture is the backbone of the impact area's economy. The ranches are generally large and devoted to cattle grazing. The rangeland isn't very productive; it takes from 10 to 30 acres of land to graze one cow for a seven-month grazing season. Irrigated farming utilizes only a small fraction of the land--less than 1 percent. The major irrigated crop is hay and is generally used for winter cattle feed and not sold as a cash crop. Many ranchers lease adjoining federal or state land and rely on that land to graze their cattle during the summer.

There is a lot of coal in the impact area--about 32 billion tons of strippable coal. There are a lot of Ponderosa pine trees too, but many of the stands are not of commercial quality.

Water is a precious commodity for agricultural, industrial, and domestic uses. The Tongue River Reservoir is the only large water storage facility in the area and is largely devoted to supplying water for agriculture.

Outdoor recreation consists mainly of hunting and fishing. The study area lacks any well-known scenic attractions and, except for hunting--primarily on the Ashland Division of the Custer National Forest--does not draw many people to the area for recreational purposes.

None of the towns in the impact area is incorporated, so basic public services are provided either by county government or by special improvement districts. Consequently, the public services available are quite limited. But more importantly, there are no local governments or broadly based groups of people currently capable of providing coordinated growth planning for the impact area. This isn't too surprising considering the fact there hasn't been much growth in the study area lately--but growth is on the horizon.

Chaper III began with a look at surface coal mines and gasification plants. Large strip mines of the 10-million-ton-per-year size employ about 220 highly paid workers. Gasification plants are expected to be immense, employing about 625 workers and costing approximately $350 million to build. The construction period for such a plant would last about three and a half years and require up to 3,000 construction workers per year.

Four alternative courses of coal-related development were used as the basis for projecting the economic impacts on employment, income, and population in the study area and the seven-county area. Two alternatives involve gasification plants and surface mines, and two involve only surface mines exporting coal from the study area. Due to the proximity of Sheridan, Wyoming, and indications that many workers in the southern part of the area would probably prefer to live there, two sets of projections were made for each alternative, differing only in the future residence assumption. The first set assumes that all coal workers live and spend in the impact area. The second assumes that 50 percent of the workers live in Wyoming and spend nothing in Montana.

What do the projections reveal? First, coal-related development will generate considerable employment in the area. The primary jobs created will be "high-powered" jobs; that is, they will pay between $12,000 and $16,000 per year using current (1974) wage scales. The expenditure of those incomes in the impact area will create a substantial number of lower-paying derivative jobs.

To the extent that workers live in Wyoming and spend their money there, that state will benefit from derivative employment and income. On the other hand, the incomes of nonresidents will be subject to Montana income tax laws and generate revenue for Montana state government, even though the nonresidents receive very few governmental services in return.

Second, the negative impact on agriculture from strip mining will not be very great. Even when we assume the worst--that the land disturbed by mining will not be reclaimed to a productive state--the farm earnings lost in 1985 will only be about 1 percent of the total primary earnings generated by coal-related development in any of the scenarios. Only if large portions of irrigated cropland are disturbed or serious water shortages are created by mining will the agricultural base of the study area be jeopardized.

Third, the population of the impact area will grow substantially as a result of coal development--possibly tripling by 1985 under Scenario IIIA, the highest level of development considered. However, the population in the impact area probably won't grow as fast as the employment opportunities will. The natural increase in the local population and historical patterns of outmigration indicate that many of the new jobs, primary and derivative, could be filled by residents. Of course, this would depend upon the establishment of programs to train local residents for the coal-related jobs.

Fourth, the impacts on employment, population, and income in the seven-county area will be relatively small. Only when we look at the scenarios involving gasification plants do the effects of coal development on the seven counties really become noticeable.

The successful operation of gasification plants in the study area seems to be contingent upon first constructing additional water storage facilities or aqueduct systems to supply the large quantities of water needed by the plants. Considering the water requirements, the political stance of the state concerning environmental issues, the fact that no plant of this size is yet in operation, and the construction time involved, it is very doubtful any gasification plants will be in operation by 1980, and even questionable for 1985. If gasification does become a reality in the impact area and large numbers of people move in to fill the new job openings, the area will still be basically rural in nature. Even with a population of 13,800 projected for 1985, Scenario IIIA, the population density of the area (3.8 persons per square mile) would be substantially less than for either the seven counties or the state. physical sense?

The crucial question will be: Where will the new residents live? Will they turn Birney and Ashland into "boom towns" or form new communities closer to the coal mining and conversion sites? Much will depend upon the location and type of development. But regardless of which scenario turns out to be the most accurate prediction, or where the development is located, some serious planning must be initiated to cope with the almost inevitable problems of growth in the study area. Efforts of public employees in federal, state, and local agencies operating in the area might well be directed toward encouraging the establishment of citizen planning groups.

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